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Bibliometric analysis of the 250 most cited articles about Cisplatin Nephrotoxicity

Análisis bibliométrico de los 250 artículos más citados sobre nefrotoxicidad por cisplatino

Ilyas Ozturk[1], Mehmet Uzun[2]

RESUMEN

Introducción: El cisplatino es un fármaco antineoplásico, comúnmente utilizado para el tratamiento de tumores sólidos. La nefrotoxicidad es uno de los efectos secundarios más importantes. En nuestro estudio, nuestro objetivo fue presentar una perspectiva objetiva sobre este tema mediante la realización de un análisis bibliométrico de artículos escritos en el campo de la nefrotoxicidad por cisplatino en la literatura. **Materiales y métodos**: Gracias al análisis de la base de datos de la Web of Science (WoS) Core Collection, se identificaron e investigaron los 250 artículos originales escritos en inglés sobre nefrotoxicidad por cisplatino con más citas. **Resultados**: De 10.242 artículos relacionados con la nefrotoxicidad por cisplatino, después de los criterios de exclusión, se identificaron 250 artículos originales con el mayor número de citas. Estos artículos se publicaron en 90 revistas diferentes. El país con el mayor número de publicaciones y de publicaciones con más citas sobre este tema fue Estados Unidos de América (EE. UU.). El artículo con más citas fue escrito por Mishra et al. La revista más productiva fue Kidney International, mientras que la más efectiva fue Journal of Clinical Investigation. **Conclusión**: Este estudio es el primer análisis bibliométrico en la literatura relacionada con la nefrotoxicidad por cisplatino. Los estudios realizados hasta la fecha en la literatura se han centrado en el daño causado y los mecanismos del cisplatino en la insuficiencia renal. Es notable el número relativamente bajo de estudios sobre la prevención de esta lesión. Los estudios actuales que se realizarán sobre este tema pueden atraer el interés de los investigadores

Palabras clave: Bibliometría; Cisplatino; Nefrotoxicidad; Web of Science

ABSTRACT

Introduction: Cisplatin is an antineoplastic drug commonly used to treat solid tumors. Nephrotoxicity is one of the most important side effects. Our study aimed to present an objective perspective on this topic by performing a bibliometric analysis of literature articles on cisplatin nephrotoxicity. **Materials and Methods:** Due to analysis of the Web of Science (WoS) Core Collection database, the 250 original articles written in English about cisplatin nephrotoxicity with most citations were identified and

Correspondencia:
Ilyas Ozturk
ORCID:
0000-0001-9431-8068
drilyasozturk@gmail.com

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1) Kahramanmaras Necip Fazil City Hospital, Nephrology Department, Kahramanmaras, Turkiye
2) Kahramanmaras Necip Fazil City Hospital, Medical Oncology Department, Kahramanmaras, Turkiye

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investigated. **Results**: From 10,242 articles related to cisplatin nephrotoxicity, 250 original articles with the highest citation numbers were identified after exclusion criteria. These articles were published in 90 different journals. The country with the most publications and publications with the most citations about this topic was the United States of America (USA). The article with the most citations was written by Mishra et al. The most productive journal was Kidney International, while the most effective was the Journal of Clinical Investigation. **Conclusion**: This study is the first bibliometric analysis in the literature related to cisplatin nephrotoxicity. To date, studies have focused on the mechanisms and injuries caused by cisplatin in kidney dysfunction. The relatively low number of studies about preventing this injury is notable. Current studies that will be performed on this topic may attract researchers' interest.

Keywords: Bibliometric; Cisplatin; Nephrotoxicity; Web of Science

INTRODUCTION

Cisplatin is a chemotherapy drug that is commonly used, with well-known efficacy [1]. It is frequently used in the treatment of testis, head and neck, ovarian, cervical, non-small cell lung cancer, and several other solid cancer types [2]. The basic effect mechanism stops DNA synthesis and replication by binding to DNA [3]. Though efficacy is well-known, two important problems restrict its use: cisplatin resistance and side effects [4,5]. Led by nephrotoxicity, the most commonly observed side effects are neurotoxicity, ototoxicity, nausea, and vomiting [5].

Many studies are related to cisplatin nephrotoxicity, especially those performed on animal renal failure models. Studies reported that nephrotoxicity may be observed in nearly one in three patients using cisplatin. Clinically, cisplatin nephrotoxicity is generally observed 10 days after cisplatin administration and is suggested by reduced glomerular filtration rate, increased serum creatinine levels, and reduced serum magnesium and potassium levels [6]. For years, a variety of approaches have been trialed to reduce the side effects linked to cisplatin, led by nephrotoxicity. One approach comprised using new cisplatin analogs with lower toxicity in normal tissue. With this aim, several cisplatin analogs, like carboplatin, were identified with fewer and milder side effects [7]. Another approach is to hydrate patients during cisplatin treatment [8]. The effects of these approaches remain limited or cause doubts about treatment efficacy.

Researchers find it very difficult to access and judge all articles related to cisplatin nephrotoxicity in the literature. Knowing the popular articles and journals, the authors, and the countries performing the most research on this topic will allow researchers to access the information they want more rapidly. Bibliometric analysis is a quantitative analysis of literature related to a topic [9]. It allows researchers to obtain a detailed perspective on a topic, determine gaps in the research field, acquire new research ideas, and predict possible contributions that will offer new research [10] to literature.

In our study, the aim was to determine the current status, research trends, and deficiencies related to cisplatin nephrotoxicity by performing a bibliometric analysis based on literature screening of the Web of Science (WoS) database related to cisplatin nephrotoxicity and thus to prepare the way for the research in the future.

MATERIALS AND METHODS

Search strategy

Articles obtained after searching the WoS Core Collection database on 22 October 2024 were investigated for this analytical research. All publications on the search outcome pages from a systematic search of the WoS interface were recorded in one file and investigated in detail by the researchers. To search, terms including "cisplatin" and (acute renal failure* or renal failure* or acute renal* or acute renal insufficiency* or acute renal injury* or acute renal dysfunction* or acute renal disease* or renal failure* or renal* or renal insufficiency* or renal injury* or renal dysfunction* or renal disease* or nephropathy* or nephrotoxicity*) topic headings were used. No date interval restriction was used during the search process.

Article Selection

Original published articles in the English language were included. Reviews, abstracts, case reports, book chapters, congress presentations, and letters to the editor were excluded from the study. Articles not in English, recurrent, or outside the topic were excluded. Article titles and abstracts were screened by two researchers for suitability. The 250 articles with the most citations were identified.

Data Collection

For the identified 250 articles, the publication year, authors, journal, author institutions, countries, keywords, and citation numbers were recorded. VosViewer software (version 1.6.10) was used to create network maps containing elements like keywords, countries, authors, and citations and to visualize and analyze trends through these maps [11].

As all data included in this analysis was obtained from previously published articles and did not involve direct human participants, there was no need for ethics committee approval for the study.

RESULTS

Using the WoS database, among 10,242 articles related to cisplatin nephrotoxicity, the top 1000 articles with the most citations were investigated. Among these articles, 760 original articles were reached. After exclusion criteria, the top 250 articles with the most citation numbers were identified from the total sample. These articles were published in 90 different journals. The flow scheme for article selection is summarized in **Figure 1**.

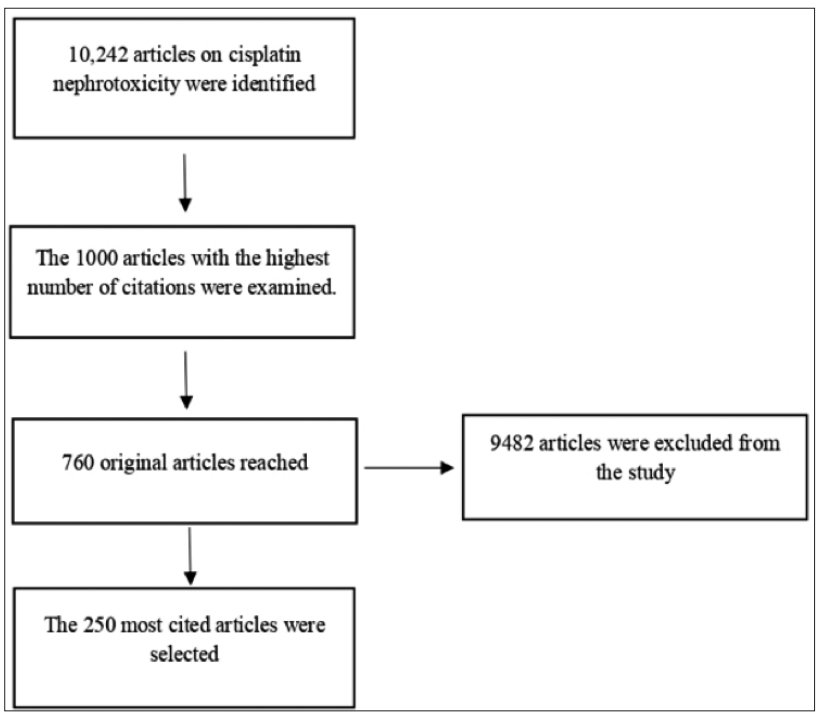

Figure 1: Flow chart of literature selection

The country with the most articles and cited publications about this topic was the United States of America (USA). The most cited article was written by Mishra et al. and published in 2003 in the Journal of the American Society of Nephrology entitled "Identification of neutrophil gelatinase-associated lipocalin as a novel early urinary biomarker for ischemic renal injury." This article received a total of 1368 citations from the date of publication. Apart from this, the top 10 articles with the most citations are summarized in **Table 1**. Among the top 250 articles, the mean citation number per article was 175.25.

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Table 1: Top 10 most commonly cited articles related to Cisplatin Nephrotoxicity

Article Title	Authors	Country	Journal	Year	Citations
Identification of neutrophil gelatinase-associated lipocalin as a novel early urinary biomarker for ischemic renal injury	Mishra, J et al.	USA	Journal of The American Society of Nephrology	2003	1368
TNF-α mediates chemokine and cytokine expression and renal injury in cisplatin nephrotoxicity	Ramesh, G.et al.	USA	Journal of Clinical Investigation	2002	736
Regulation of mitochondrial dynamics in acute kidney injury in cell culture and rodent models	Brooks, C et al	USA	Journal of Clinical Investigation	2009	604
Mesenchymal stem cells are renotropic, helping to repair the kidney and improve function in acute renal failure	Morigi, M et al.	Italy	Journal of The American Society of Nephrology	2004	599
Cisplatin Induces a Mitochondrial-ROS Response That Contributes to Cytotoxicity Depending on Mitochondrial Redox Status and Bioenergetic Functions	Marullo, R et al.	USA	Plos One	2013	565
Kidney injury molecule-1: a tissue and urinary biomarker for nephrotoxicant-induced renal injury	Ichimura, T et al.	USA	American Journal of Physiology-Renal Physiology	2004	524
Urinary kidney injury molecule-1: a sensitive quantitative biomarker for early detection of kidney tubular injury	Vaidya, VS et al.	USA	American Journal of Physiology-Renal Physiology	2006	516
Exosomes released by human umbilical cord mesenchymal stem cells protect against cisplatin-induced renal oxidative stress and apoptosis *in vivo* and *in vitro*	Zhou, Y et al	China	Stem Cell Research & Therapy	2013	503
Intraperitoneal Cisplatin with Systemic Thiosulfate Protection	Howell, Sb Et al.	USA	Annals of Internal Medicine	1982	485
Neutrophil gelatinase-associated lipocalin: A novel early urinary biomarker for cisplatin nephrotoxicity	Mishra, J et al.	USA	American Journal Of Nephrology	2004	421

When the distribution of most cited articles was investigated yearly, the article numbers had a fixed interval from 1980 to 2000 and increased in 2001 to ten. While an increasing trend in article numbers was noted until 2008, a reducing trend was identified from that year to 2022. The distribution of article numbers according to year is shown in **Figure 2**

The journal with the most citations and the most articles was Kidney International. When the mean number of citations per article is investigated, the Journal of Clinical Investigation has a mean citation number per article of 322. According to the number of published articles, the Journal of Clinical Investigation is the most effective journal regarding citations. The top 5 journals, according to article numbers published, are presented in **Table 2**.

Figure 3 shows the density map for authors of articles related to cisplatin nephrotoxicity and the relationships between authors.

Figure 2: Distribution of the number of articles by year

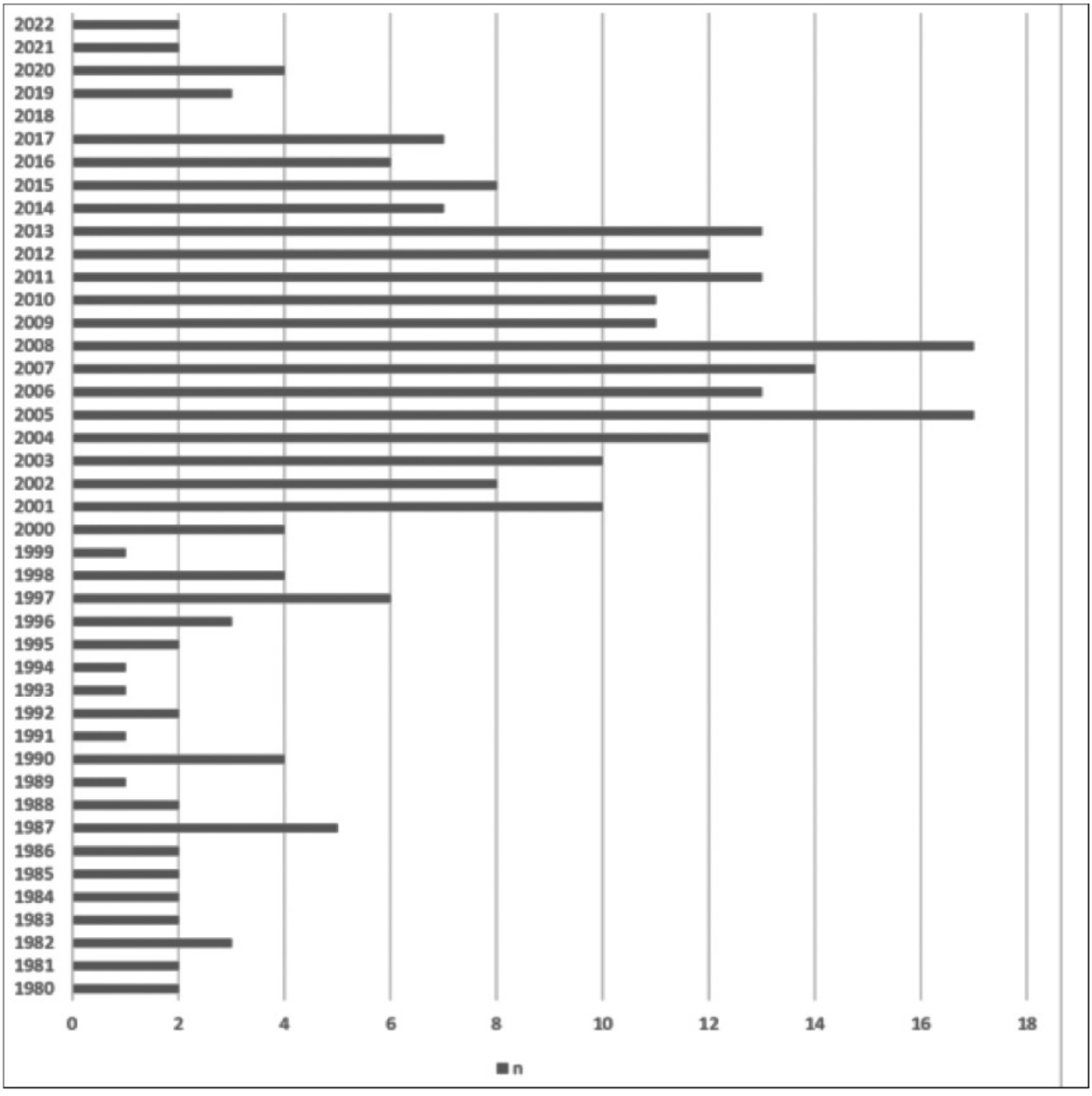

Table 2: Top 5 journals according to the number of published articles

Journal Name	Number of Articles	Number of Citations	Number of Citations per Article
Kidney International	31	5594	180
American Journal of Physiology-Renal Physiology	23	4085	177
Journal of The American Society of Nephrology	20	5153	245
Journal of Clinical Investigation	8	2577	322
Journal of Pharmacology And Experimental Therapeutics	8	1601	200

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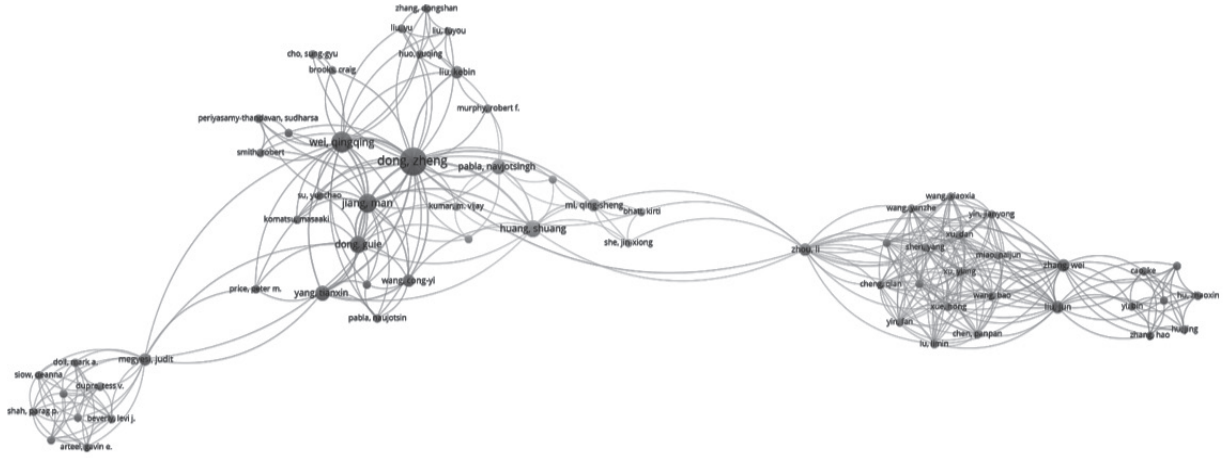
Figure 3: Matching overlay map of the authors writing articles



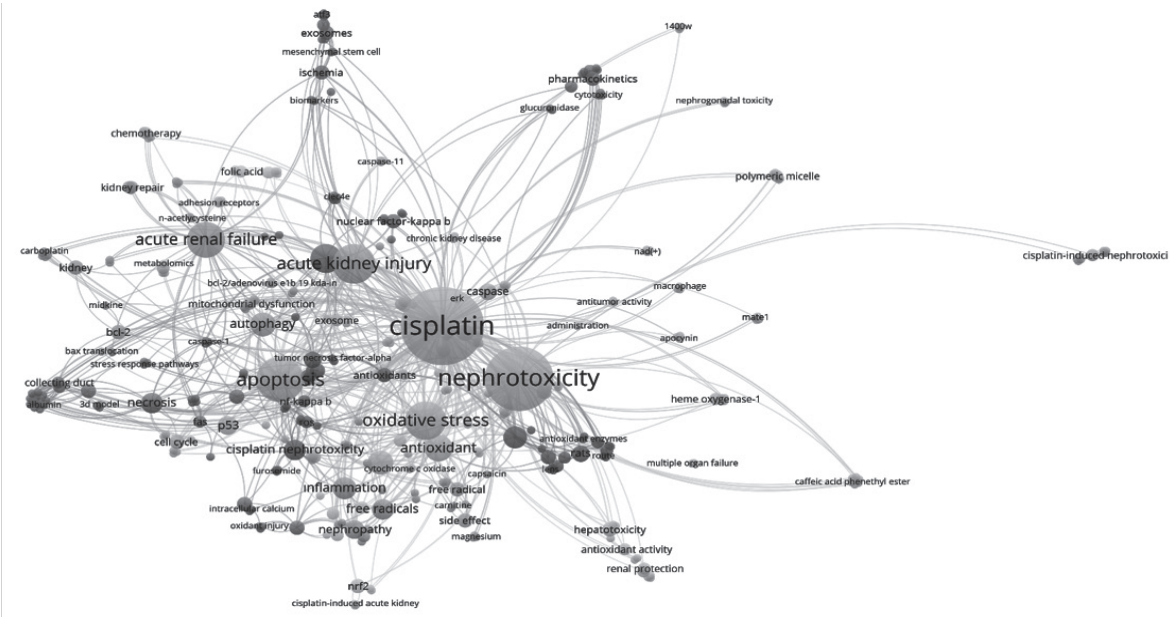
When the authors of the most cited articles related to cisplatin nephrotoxicity were investigated, Zheng Dong contributed 11 articles and was the most cited author with 2498 citations. The top 5 authors contributing most to the most cited 250 articles are presented in **Table 3**.

The most frequently used keyword was "cisplatin," followed by "nephrotoxicity." **Figure 4** displays a map showing keywords and their relationships.

Table 3: Top 5 contributing authors

Author Name	Number of Articles	Number of Citations
Dong, Zheng	11	2498
Wei, Ginging	6	1718
Ramesh, G	5	1511
Reeves, WB	5	1511
Benigni, Ariela	4	1026

Figure 4: Keyword co-occurrence overlay map



DISCUSSION

Cisplatin is a chemotherapy drug that has been used for a long time, with well-known efficacy. Observation of significant side effects led by nephrotoxicity, including ototoxicity and neurotoxicity, has not affected its clinical significance and frequency of use. Though non-cisplatin platin analogs are considered an alternative to cisplatin, their use remains limited. Our study aimed to determine and identify the articles with the highest impact on this topic with bibliometric analysis by performing literature screening of the WoS database related to cisplatin nephrotoxicity. This study is the first bibliometric analysis related to cisplatin nephrotoxicity.

Cisplatin has long been used to treat several solid cancers, including testis and head-neck. The incidence of these cancers is relatively higher in the USA compared to other countries [12,13]. As a result, cisplatin is probably used more in this country, and linked complications are observed. Another aspect is that the USA is one of the pioneering countries in cancer research. Comprehensive multidisciplinary centers and funds for clinical research in the USA provide more significant support for this topic than in other countries. These facts explain that the USA is the country that contributes most to the literature, as it is the country with the most publications about cisplatin nephrotoxicity and the most citations for these publications. Again, the researcher who contributed the most to the literature, with 11 articles and 2498 citations, was Zheng Dong from the USA.

Though cisplatin preserves the feature of being the most frequently used platin analog, the use of other platin analogs like carboplatin and oxaliplatin is becoming increasingly popular due to both cisplatin resistance and side effects [14]. As information related to both side effects and resistance is very well-known by all academics, the popularity of this topic has reduced in recent years. This reduction is understandable from the number of articles written about this topic. The years with most articles written about this topic were 2005 and 2008, especially with 17 articles per year. This topic, when popularity reached its highest levels from 2001-2008, has not attracted the interest of academics so much in recent years.

Citations are the best indicator of the contribution to the science of an article. Though not direct, the indirect and accepted opinion is that the contribution of an article to science is as high as the number of citations. In our analysis, the most productive journal was Kidney International, with the highest citation numbers (5594) and article numbers (31). The journal with the highest mean citations per article (322) was the Journal of Clinical Investigation. As a result, the Journal of Clinical Investigation, with the highest mean citation number, is the most effective journal on this topic.

The first studies on cisplatin nephrotoxicity focused on the disease physiopathology, injury mechanisms, and reasons for occurrence. In contrast, the focus has recently been on preventive precautions and protective treatments. Bibliometric analysis is important because it shows research trends in this way. In our study, the most frequently used keywords in the analysis were "cisplatin" and "nephrotoxicity," followed by "apoptosis," "acute renal injury," "acute renal failure," and "oxidative stress." As understood from this, studies in the literature to date have intensified about the injury and mechanisms of cisplatin in kidney dysfunction. The relatively few studies performed on preventing injury are notable. Current and future studies on this topic may attract researchers' interest.

CONCLUSION

Like other bibliometric studies, our study's limitations include some bias that may have occurred when selecting articles and in the analysis process due to screening a database and using a single database.

In conclusion, bibliometric analysis is a tool for understanding the general status of literature, research trends, and deficiencies in the field. Our study is valuable as it is the first study of this topic in the literature. Unlike traditional studies, it presents an original and objective perspective about cisplatin nephrotoxicity. The increase in these and similar-scope studies will be important to guide new research areas.

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