Original Article / Orijinal Araştırma

Bibliometric Analysis of Scientific Literature on Acanthamoeba Keratitis

Acanthamoeba Keratitinin Bibliyometrik Analiz Yöntemiyle Değerlendirilmesi

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Abstract

Aim: Our research aimed to assess Acanthamoeba keratitis research trends and compare contributions from various nations, institutions, journals, and authors.

Material and Method: A bibliometric design was used. We used the Web of Science database to extract all Acanthamoeba keratitis articles from 1970 to 2021. To collect publishing data, analyze publication trends, and visualize relevant data, Microsoft Excel and VOSviewer were used.

Results: 171 (31.784 %) of them were published as open Access. 92.751% of them were published in Science Citation Index Expanded indexed journals. The mean number of citations was 13733, with a median of 25.53, and the H index was 63. 77.32 % of the articles were published since 2000. University of Texas in the United States had the highest number of publications (78, 14.499%), followed by the University of London in the UK (63,11.71%). The United States (USA) ranked first in the number of publications (151, 28.067%), followed by the United Kingdom (49, 9.108%) and Germany (31, 5.762%). Publications from the USA were cited 6,344 times (42.01/ median per publication), while publications from the UK were cited 2,949 times (60.18/median per publication). Acanthamoeba keratitis research has increased significantly in the last 15 years.

Conclusion: With the use of information visualization analysis, we were able to gain a wide understanding of the state of affairs, recognize trends, and identify hotspots. It is a more effective way to learn the literature and could give future researchers summarized data.

Keywords: Bibliometric studies, Acanthamoeba, keratitis, publications, contact lens

Öz

Amaç: Çalışma, Acanthamoeba keratitinin araştırma eğilimlerini değerlendirmeyi ve çeşitli ulusların, kurumların, dergilerin ve yazarların katkılarını karşılaştırmayı amaçlamaktadır.

Gereç ve Yöntem: Bibliyometrik bir analiz yapıldı. 1970'den 2021'e kadar tüm Acanthamoeba keratiti makalelerini değerlendirmek için Web of Science veritabanı kullanıldı. Yayın verilerinin toplamak, yayın eğilimlerini analiz etmek ve ilgili verileri görselleştirmek için Microsoft Excel ve VOSviewer kullanıldı.

Bulgular: Yukarıda ayrıntıları verilen metodolojiye göre 538 makaleye ulaşıldı. 171 tanesi (%31.784) açık erişim olarak yayınlandı. Bunların %92.751'i Science Citation Index Expanded indeksli dergilerde yayınlandı. Ortalama atıf sayısı 13733, medyan değeri 25,53, H indeksi ise 63 idi. Makalelerin %77,32'si 2000 yılından sonra yayınlanmıştır. En fazla yayın Amerika Birleşik Devletleri'ndeki Texas Üniversitesi'nde yapılmış olup (78, %14,499) onu İngiltere'deki Londra Üniversitesi (%63,11,71) izledi. Yayın sayısında Amerika Birleşik Devletleri (ABD) ilk sırada yer alırken (%151, 28.067), onu Birleşik Krallık (%49, 9.108) ve Almanya (%31, 5.762) izledi. ABD'den yayınlara 6.344 kez (yayın başına 42.01/medyan), Birleşik Krallık'tan yayınlara 2.949 kez (yayın başına 60.18/medyan) atıf yapıldı. Acanthamoeba keratit araştırmaları son 15 yılda önemli ölçüde artmıştır.

Sonuç: Bilgi görselleştirme analizini kullanarak, Acanthamoeba keratiti hakkında geniş bir bakış açısı sunulmuştur. Yapılan çalışmaların eğilimleri ve önemli noktaları belirlenmiştir. Bu çalışma, Acanthamoeba keratiti ile ilgili yapılan çalışmaları öğrenmenin etkili yollarından biridir ve araştırmacılar için özetlenmiş bilgiler sağlamaktadır.

Anahtar Kelimeler: Bibliyometrik çalışmalar, Acanthamoeba, keratit, yayınlar, kontakt lens

INTRODUCTION

Acanthamoeba amoeba is globally seen as organisms that may thrive as free-living organisms as well as parasites within the host tissue. Acanthamoeba infections pose a significant danger to human health and are associated with a high fatality rate, particularly in immunocompromised patients.[1] Because of their worldwide spread, these amoebas are among the most numerous protozoa in nature, and they can live in a wide, range of environments and severe settings by forming structures known as cysts.[2] Acanthamoeba spp. can be found in lakes, swimming pools, tap water, and heating and cooling equipment. Acanthamoeba species linked to human illness include A. culbertsoni, A. polyphagia, A. castellanii, A. astronyxis, A. hatchetti, A. rhysodes, A. divionensis, A. lugdunensis, and A. lenticulata.[3]

These protozoa are responsible for the etiology of granulomatous amoebic encephalitis (GAE) and Acanthamoeba keratitis (AK).[1] It has been reported that 8 species and five genotypic classes of Acanthamoeba cause keratitis.[4] AK is an uncommon but severe eye inflammation of the lining, permanent vision impairment, or blindness. [5] Furthermore, the number of reported cases globally is growing year after year, primarily in contact lens wearers, however, cases have been documented in non-contact lens wearers as well. Symptoms and signs of AK are pain with photophobia, stromal ring-shaped infiltrates, epithelial defect, and lid edema. Interestingly, despite breakthroughs in antimicrobial treatment and supportive care, Acanthamoeba keratitis has remained prevalent. This is partly due to a lack of understanding of the disease's origin and pathophysiology, as well as diagnostic delays and issues associated with chemotherapeutic therapies.[6]

In this study, we conducted a quantitative evaluation of the existing literature on Acanthamoeba keratitis. Based on Web of Science (WOS) data, the report presents a broad overview of the current state of global Acanthamoeba keratitis research. The bibliometric method was used to find trends in Acanthamoeba keratitis research and explore possible hotspots.

MATERIALS AND METHODS

Research Model: A bibliometric analysis study

Data Collection: To retrieve the research publications, the Web of Science Core Collection (previously known as the Web of Knowledge) database (Clarivate Analytics, Philadelphia, PA, USA) was used. Data were obtained from the database on April 15, 2022.

The titles, document types, years of publication, names of authors, affiliations, keywords, group authors, names of publishing journals, abstracts of each record, and citations within the WOS publications were saved as TXT files and were imported into Microsoft Office Excel 2019 (Los Angeles, CA, USA).

We utilized the Hirsch equation (H-index) for qualitative analysis, which is the most extensively used measurement to quantify both the quality and quantity of a publication group. The H-index was calculated using the Web of Knowledge's Citation Report.

Overview of the output from the WoS database: The WoS database was used to identify the publishing year, country or nation, study category, authors, and citation numbers of the retrieved publications. As a timeline, only articles published between 1971 and 2021 were considered, as we aimed to analyze the 50 years situation. Since 2022 has not been completed yet, publications in this period were excluded from the study.

Microsoft Excel 2013 for Windows was used to transfer the data (Microsoft Corp., Redmond, WA, United States of America, USA). The citations were analyzed using the Wos database. The Hirsch-Index (h-Index) was utilized as a measure of research output quality, and the number of publications was used as a metric of research quantity. The total number of citations as well as the average number of citations per item were computed for each publication (citation rate). The findings' bibliometric data was kept in a separate database and displayed in tables as visualizations.

The following search technique was implemented:
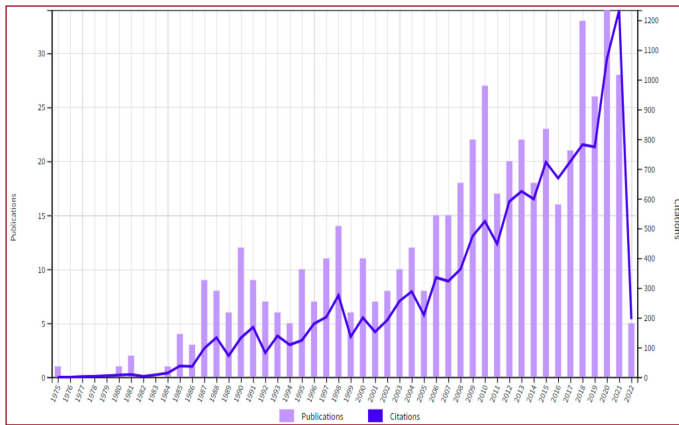
Title: Acanthamoeba keratitis

Document Type: Article. Other manuscript formats such as case reports, editorials, and letters were eliminated from the search because they were not peer-reviewed articles.

Timespan: 1970–2021.

Mapping: To visualize country collaboration networks and keywords, the VOSviewer 1.6.18 for Microsoft Windows systems program was used. We created co-occurrence networks from the obtained publications' bibliographic metadata (e.g., nations, citations, and keywords).

RESULTS

According to the methodology detailed above, we retrieved 538 articles. 171 (31.784%) of them were published as Open Access (OA) and 92.379% of them were in the English language. Other rarely preferred languages were German (3.903%), French (2.788%), and other languages (Spanish, Korean and Malay). 499 (92.751%) of them were published in Science Citation Index Expanded (SCI-EXPANDED) indexed journals. The mean number of citations was 13733, with a median of 25.53, and the H index was 63. The number of citations and published articles has increased over the years. 416 (77.32%) of the articles were published since 2000. 2020 was the year with the most publications in terms of the number of publications per year (34, 6.320 %) (**Graphic 1**).
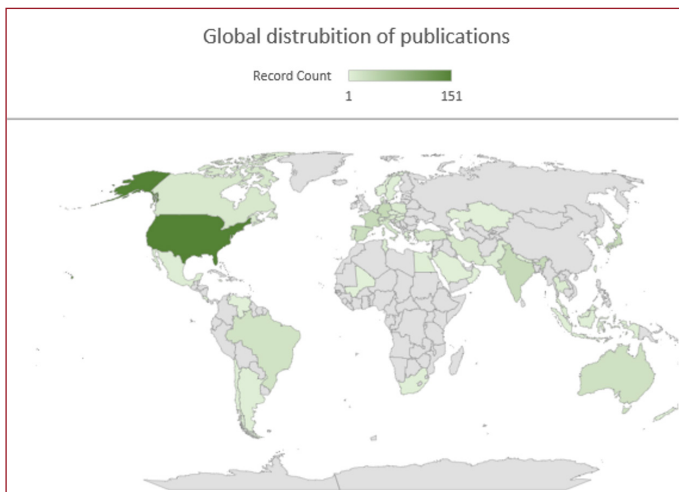
Graphic 1. The number of published articles and citations on Acanthamoeba keratitis.

The United States (USA) ranked first in the number of publications (151, 28.067%), followed by the United Kingdom (49, 9.108%) and Germany (31, 5.762%) (**Table 1**) (**Graphic 2**). Publications from the USA were cited 6,344 times (42.01/median per publication), while publications from the UK were cited 2,949 times (60.18/median per publication).

Table 1. Top 10 countries on publications.

Countries/ Regions	Record Count, %	Number of citations	H indexes	Number of citations average per publication
The USA	151(28.067)	6350	47	42.05
United Kingdom	49(9.108)	2952	26	60.24
Germany	31(5.762)	319	10	10.29
Japan	31(5.762)	477	13	15.39
France	29(5.390)	253	9	8.72
India	29(5.390)	667	11	23
Spain	26(4.833)	407	12	15.65
China	25(4.647)	561	12	22.44
Australia	21(3.903)	423	12	20.14
Brazil	19(3.532)	280	10	14.74

Total 56 countries, 4 record(s) (0.743%) do not contain data in the field being analyzed

Graphic 2. Global distribution of publications

The University of Texas in the United States had the highest number of publications (78, 14.499%) followed by the university of London in the UK (63,11.71%) on Acanthamoeba keratitis (**Table 2**).

Table 2. Publications from the top 20 organizations Acanthamoeba keratitis research.

Organizations	Record Count	% of 538
University of Texas	78	14.499
University of London	63	11.71
University of Illinois Chicago	39	7.248
Moorfields Eye Hospital NHS Foundation Trust	28	5.204
Centers for Disease Control Prevention USA	17	3.160
League of European Research Universities Leru	16	2.974
Udice French Research Universities	13	2.416
Universidad de La Laguna	13	2.416
University of California System	13	2.416
L V Prasad Eye Institute	11	2.045
Baylor College of Medicine	10	1.859
Chno Des Quinze Vingts	10	1.859
Harvard University	10	1.859
Ohio State University	10	1.859
Sorbonne University	10	1.859
Universitatsklinikum Des Saarlandes	10	1.859
Tehran University of Medical Sciences	9	1.673
University of Iowa	9	1.673
Capital Medical University	8	1.487
Jefferson University	8	1.487

*Showing 20 out of 701 entries; 4 record(s) (0.743%) do not contain data in the field being analyzed

Most of the articles were from Ophthalmology (65.985%), Parasitology (9.294%), and Microbiology (8.364%) research areas (**Table 3**).

Table 3. Number of articles according to the research areas.

Research Areas	Record Count	% of 538
Ophthalmology	355	65.985
Parasitology	50	9.294
Microbiology	45	8.364
Infectious Diseases	24	4.461
General Internal Medicine	21	3.903
Immunology	18	3.346
Public Environmental Occupational Health	17	3.160
Tropical Medicine	13	2.416
Pharmacology Pharmacy	10	1.859
Science Technology Other Topics	10	1.859

*Showing 10 out of 29 entries

Cornea journal published most of the articles (**Table 4**).

Table 4. The list of journals published more than five articles.		
Publication Titles	Record Count	% of 538
Cornea	68	12.639
American Journal of Ophthalmology	33	6.134
Ophthalmology	31	5.762
Parasitology Research	21	3.903
Archives of Ophthalmology	19	3.532
British Journal of Ophthalmology	18	3.346
Investigative Ophthalmology Visual Science	15	2.788
Eye Contact Lens Science and Clinical Practice	14	2.602
Journal of Clinical Microbiology	13	2.416
Experimental Parasitology	11	2.045
Klinsche Monatsblatter Fur Augenheilkunde	11	2.045
Journal Francais D Ophtalmologie	10	1.859
Ophthalmologe	9	1.673
Current Eye Research	8	1.487
Eye	8	1.487
Contact Lens Anterior Eye	7	1.301
Acta Ophthalmologica	6	1.115
Canadian Journal of Ophthalmology	6	1.115
Clinical Ophthalmology	6	1.115
Clinical and Experimental Ophthalmology	5	0.929
*total 159 entries		

Mapping

The network analysis and mapping from the obtained publications' bibliographic metadata (e.g., nations, citations, and keywords) were given in **Figures 1-3**.
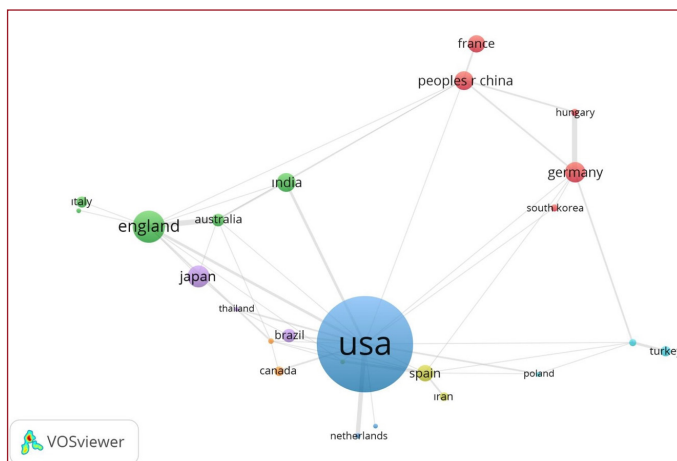

Figure 2. Number of articles from countries and co-authorship analysis

DISCUSSION

Although bibliometrics studies on a variety of topics have been used in the field of ophthalmology,[7-16] none of them have focused on Acanthamoeba keratitis. The use of scientometrics in the field of ophthalmology makes it easier to investigate the productivity of local medical facilities, which aids in the right allocation of future research funds. Because of advances in health informatics, scientometrics can now assess the impact of publications using citation reports, knowledge mapping tools, and other quantitative bibliometrics characteristics.[17]
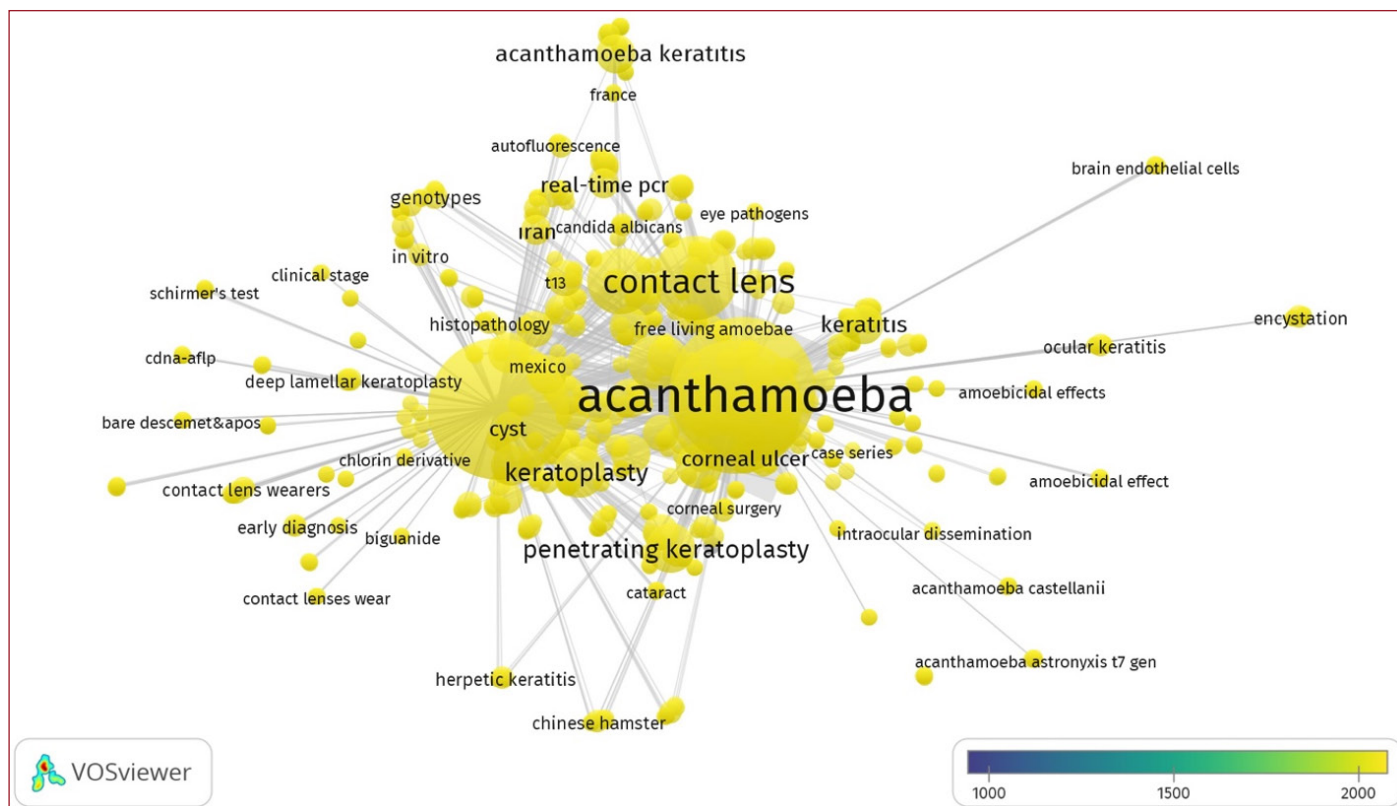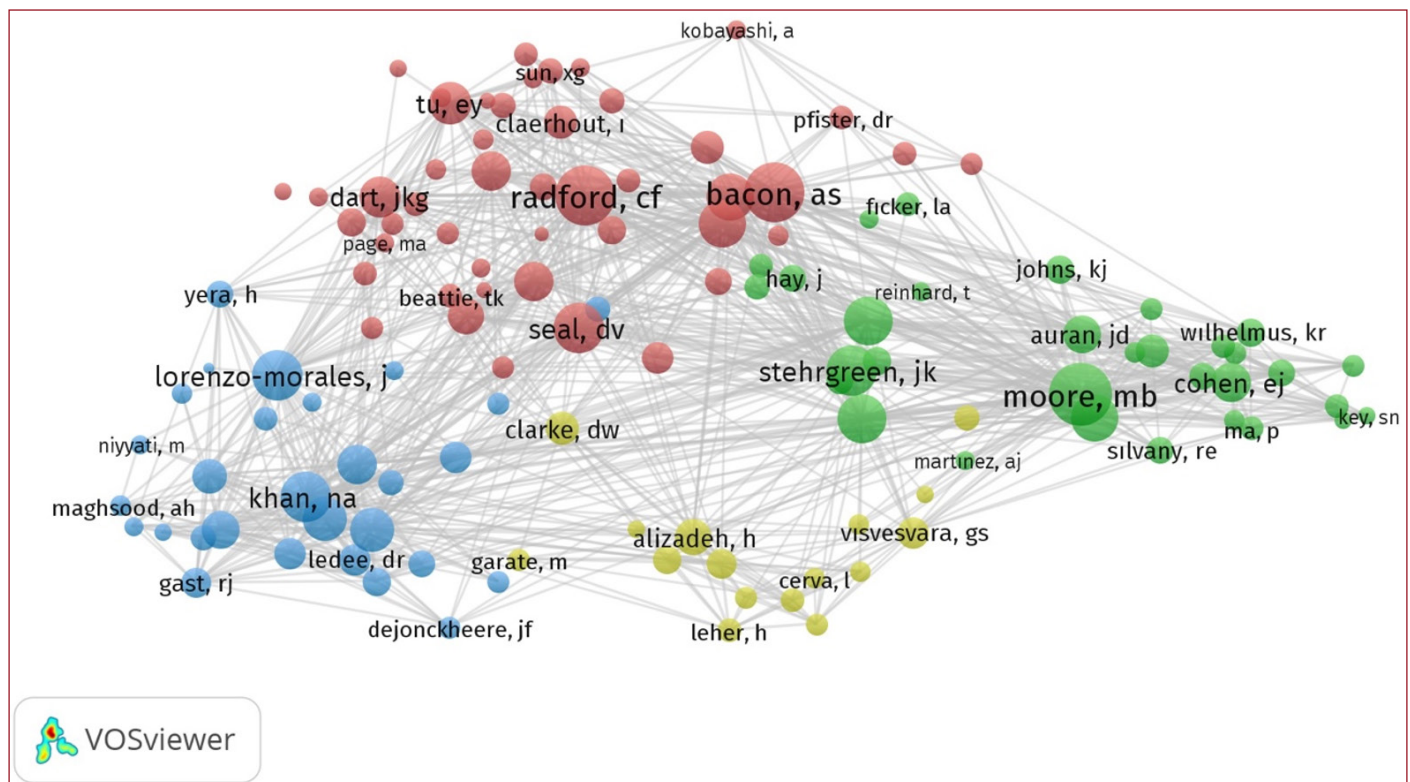

Figure 1. Keyword analysis

Figure 3. Citations analysis between authors.

This visualized scientometric method was used to determine the general state and trends, as well as hot spots in the Acanthamoeba keratitis research topic. We retrieved 538 articles in the WoS database after carrying out a detailed search. The USA, UK, Germany, Japan, and France were the five most productive countries. The USA also dominated this area in terms of the number of published articles. After the 2000s, the rising trend in the contribution rate was at a level that could not be ignored. According to journal analysis, ophthalmologists and parasitologists are the researchers most interested in Acanthamoeba keratitis research.

As the study becomes more collaborative, it is critical to investigate the relationships between researchers from various countries. We used VOSviewer to analyze the co-occurrence to identify the top authors, nations, institutions, and journals. Each cluster indicated an object in the network map generated by this software, such as authors or nations; the size of clusters represented occurrence frequencies, and the color of clusters reflected which cluster the node belonged to based on a co-occurrence analysis. Meanwhile, the connections between neighboring points indicated that the two components were working together (such as authors or institutions). The connecting lines become thicker as the frequency of collaboration increases (**Figures 1-3**). The publications from the USA were cited 42.01/median per publication, and the publications from the UK were 60.18/median citations per publication. In summary, although the publications from the UK were

numerically less than the USA, they were cited more than the publications in the USA.

Before the investigation, similar studies in the literature were examined, and the methodology was developed based on those studies.[15-17] WoS is a respected and trustworthy scientific database that is frequently utilized in academia. On WoS, users might quickly access all of the article data and scientific impact metrics used in the bibliometric study. As a result, it has been frequently utilized in comparable bibliometric research.[7-14,18] We used the WoS advanced search engine to conduct the quantitative search because it provides a standard dataset for analyzing and tracking bibliographical criteria such as author names, keywords, affiliation, country, journal title, number of citations, and broad subject areas.

To our knowledge, this is the first article on Acanthamoeba keratitis to use visualized bibliometrics analysis. In comparison to traditional reviews, VOSviewer-based analyses display data and provide a more complete picture of the history, current state, and research priorities in Acanthamoeba keratitis. However, there are some restrictions. The author of the article only developed the first three names, so the correspondence author information may be omitted at times. Researchers had to read the source material themselves because bibliometrics software was unable to distinguish between fundamental author contributions in extensive collaboration. We excluded articles that were not in the WoS database and non-English literature, which limited the scope of our study.

CONCLUSION

Acanthamoeba keratitis research has increased significantly in the last 15 years. Using information visualization analysis, we were able to obtain a broad picture of the current state and trend of this study field, as well as identify hot spots. It is a more efficient way of learning the literature and may provide summary data for future studies.

ETHICAL DECLARATIONS

Ethics Committee Approval: Because the data were obtained from publicly available studies, no ethical approval was required.

Informed Consent: Informed consent was not required.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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