BMJ Open Ophthalmology

# Bibliometric analysis of the uveitis literature and research trends over the past two decades

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**To cite:** Gao T, Monson H, Felfeli T. Bibliometric analysis of the uveitis literature and research trends over the past two decades. *BMJ Open Ophthalmology* 2023;**8**:e001330. doi:10.1136/bmjophth-2023-001330

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjophth-2023-001330).

Received 3 May 2023
Accepted 19 August 2023



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## ABSTRACT

**Objective** This study aimed to examine the publication patterns and present a current view of the field of uveitis using a bibliometric analysis.

**Design** Bibliometric analysis.

**Methods and analysis** A comprehensive search of three databases including MEDLINE, EMBASE and Cochrane was conducted from 1 January 2000 to 31 December 2022. Search results from all three databases were subjected to analysis by Bibliometrix, an R programme that analyses large literature dataset with statistical and mathematical models. Visualisation of collaboration networks and relevance between countries was presented with VOSviewer.

**Results** A total of 26 296 articles were included in the analysis. The field of uveitis has undergone a significant exponential growth since 2000, with an average growth rate of 4.14%. The most substantial annual growth was between the years 2021 and 2022 (36%). According to the corresponding author's countries, the three most productive countries were Turkey (3288, 12.6%), the USA (3136, 12%) and Japan (1981, 7.6%). The USA (243, 31.4%), England (117, 15%) and Germany (62, 8%) are the top three countries that contributed to clinical trials. The average international collaboration of all countries was 2.5%.

**Conclusions** Uveitis literature has undergone significant growth in the past two decades. The demographic factors of publishing countries lead to their various productivity and types of these uveitis studies, which is closely associated with the countries' scientific research resources and patient populations.

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Despite the advantages and relevance of bibliometric studies on ophthalmology, no bibliometric analyses have been conducted on uveitis to date of our study. We aim to establish a bibliographic profile of uveitis publications published in the past two decades to examine the trends in relevant times.

### WHAT THIS STUDY ADDS

⇒ Publications on uveitis have undergone significant growth in the past two decades. Within these publications, there are interesting collaboration patterns and significant correlations between research production and types and demographic factors of publishing countries.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study may assist in identifying areas of high research productivity for institutions to better allocate resources.

## INTRODUCTION

Uveitis is an inflammatory intraocular disease that affects the uvea tract of the eye and may lead to serious sight-threatening eye disorders. The disease has been reported to be responsible for 5%–10% of vision loss worldwide and causes 9%–15% of blindness in Western countries.[1 2] In the recent two decades, considerable efforts have been made in the field of uveitis research, which has led to a substantial growth in both the quantity and the quality of studies.[3–8] Specifically, emerging interventions for uveitis have led to more innovative methods in treating the disease such as local sustained treatments and systematic immunomodulatory therapies.[9 10]

Bibliometric studies involve the processing, collection and statistically analysing bibliographic data on a large volume of scientific publications on a chosen topic. Bibliometric studies use statistical indicators and grand bibliographic data, which allow measurement of growth and geographical distribution of publications to provide a purposeful overview on a specific topic in a particular field. Specifically, bibliometric studies may be important in evaluating and benchmarking research performance in a field with indicators such as publication size, growth, distribution and collaboration trends. These analyses may enhance the reputation of individual researchers, groups or institutions. More importantly, by reviewing emerging research trends and areas of high productivity, institutions may employ bibliometric data to identify impactful research areas to better allocate resources. Furthermore, bibliometric analyses may assist institutions in identifying potential collaboration partners based on common research interests.[11–14]

A few bibliometric studies have conducted relevant analysis on topics in the field of ophthalmology. López-Muñoz *et al* conducted a bibliometric study specifically on glaucoma research published between 1900 and 2019, which extensively explored the relevance of glaucoma publications.[15] Efron also has used the bibliometric approach to study the 200 most influential ophthalmic publications across multiple subdisciplines.[16] To date of our analysis, no bibliometric analyses have been conducted on studies related to uveitis.

Here, we aim to examine the publication trend and relevance of scientific production in uveitis, providing a bibliographic profile of the publications published between 2000 and 2022 in the relevant databases to examine the trends over times. Our study may provide a better understanding of the uveitis literature and offer insight into the future direction of uveitis research. This paper may be of special interest to readers that wish to learn about the general publication trends, common demographic features, and collaboration patterns in the field of uveitis research.

## METHODS

This is a bibliometric analysis of articles relating to uveitis. A detailed review of the bibliometric analysis study methods is reported elsewhere.[17] The protocol for this study was also prospectively published on the Open Science Framework registry (https://osf.io/xq52w/, DOI 10.17605/OSF.IO/XQ52W).

### Search strategy

A systematic search on MEDLINE, Embase and Cochrane databases was conducted from 1 January 2000 to 20 April 2022. A search update was done on 26 July 2023 to capture studies published up to 31 December 2022. The three databases were specifically selected due to their inclusivity for a wide range of ophthalmological journals, their compatibility with various bibliometric analytic software and their accessibility.

The search strategy was developed in consultation with an experienced librarian. Subject headings were used to capture all relevant studies indexed under the topic of uveitis in all three databases. No language or study design restrictions were set on the search. MeSH terms were specifically used to construct the search queries due to its standardised categorising system maintained by the National Library and Medicine. The retrieval of journal articles using their MeSH indexes allowed us to capture studies on specific topics. The details of the search queries are outlined in online supplemental table S1. Note that for each database, to avoid the inclusion of irrelevant articles, the listed terms were searched in 'title' only.

### Data retrieval

Data were retrieved through two processes on the same day. The first process was to collect research results from the MEDLINE and Cochrane database. The results from the two databases were exported as PubMed format with all fields required for the analysis directly imported into Bibliometrix R package used in this study. Because Bibliometrix only accepts a limited number of data formats, the second process involved reformatting search results from the Embase database, which is not recognised by Bibliometrix. For all citations obtained from Embase, a format modification was done with a self-written script. On merging results from both processes for all three databases, duplicates were removed with Microsoft Excel.

### Analytic methods and software used

The source dynamics of the publications were analysed with four bibliometric indicators including Price's Law, annual growth rate in percentage, Lotka's Law and Bradford's law.[18–20] Price's Law, which is one of the most widely used bibliometric indicators describes that scientific production in a particular field follow an exponential trend.[20] To determine whether literatures in the field of uveitis follows Price's Law, we performed a linear adjustment and an exponential curve adjustment on the annual publication data and obtained the equations for the fitted graph. The annual growth rate of articles published was calculated using the raw number of publications per year by dividing the difference between the annual publication number and the previous year by the previous year's annual publication number, then taking the percentage. Coauthoship index was calculated by dividing the number of total contributing authors by the number of total articles. All of the above analyses were performed using R version 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria).

Lotka's law uses a logarithmic scale to model authors' distribution by publication frequency. Lotka's law was specifically used to describe the scientific productivity of the selected journals.[19] Bradford's law was used as an indicator for dispersion of journals. Specifically, Bradford's law proposes that literature productivity could be modelled into zones, where each zone contains journals that have similar number of articles published, with zone 1 being the journals with the highest publication count.[18] By mapping journals into different zones, it may be indicative of the top journals where the highest bibliographic production was concentrated. Both Lotka's law and Bradford's law were performed using Bibliometrix R package.

Citation numbers were retrieved and examined for articles from the MEDLINE database. Most cited articles were determined by ranking the MEDLINE articles by their citation number from highest to lowest.

The international distribution and social structures of the publishing population were explored by examining several factors including the countries of publication, affiliation and overall contribution of the corresponding authors. The number of publications per country was used to rank the countries and were then compared with their corresponding single-country publication

(SCP) and multicountry publication (MCP) indices. SCP and MCP are representative of the proportion of total publications with either intranational or international collaborations and were explicitly used to further investigate the connection between the countries' overall contribution and their international collaboration level.

To better illustrate these collaborations between countries, a collaboration network map was constructed and was normalised by association strength. Each country was represented by a circle, which the size of the circle positively corresponds to the weight of the country's collaboration, and the colour correspond to one of the five clusters the country was assigned to. The distance between circles indicates the relatedness of the countries obtained from cocitation information, and the closer the two countries are, the stronger the collaborations between the two. We studied keywords by first creating a co-occurrence network map using most frequently used author's keywords. Specifically, the keyword network map may help identify clusters of related research and central themes in the field. Both of the above network maps were constructed using the VOSviewer software.

To examine the correlation between countries' scientific production and countries public health data, the countries' overall literature contribution and total per capita expenditure on health were compared. The relevant public health data were obtained from the WHO's Global Health Expenditure Database.[21]

Furthermore, the most frequently referenced terminologies in the articles were extracted and summarised based on the ranked frequency of occurrence from author's keywords of the articles. Specifically, to avoid the possible bias from hand-picking any terminologies, five main categories were developed to group the terms and the top ten most frequently occurring terminologies in each category were reported. The main categories were given names that are easy to locate based on the specific interest of perspective audiences.

## RESULTS

The initial search of the databases retrieved 28 427 unique results. Following deduplication, 26 296 articles were included in the analysis from the three databases between the years 2000 and 2022. Out of the final number of 26 296 articles, there were 17 677 articles from MEDLINE, 8401 articles from Embase and 218 from Cochrane database.

There were a total of 772 articles that were labelled as clinical trials, and these articles were mainly published by USA (31.4%, 243), England (15%, 117) and Germany (8%, 62). Additionally, between the years 2021 and 2022, a total of 356 protocols for clinical trials were recorded, which were not reflected in the final count of published manuscripts.

Price's Law of Exponential Growth fitted linear trend line for annual scientific production in uveitis literatures was obtained with the following expression y=50.944x−101304, with a correlation coefficient of 0.72 ($R^2$=0.72). Similarly, the fitted exponential curve was expressed by equation $y=2E\text{-}34e^{0.042x}$, with a correlation coefficient of 0.80 ($R^2$=0.80). The adjusted exponential trend line is shown in figure 1. Based on the correlation coefficients, an exponential fitting is moderately more appropriate to describe the growth trend of the literature production, which is in accordance with Price's Law, and infers that the growth of uveitis literature in the past two decades is exponential.

Out of all documents published between 2000 and 2022, most articles were published in the year 2022. The average growth rate from 2001 to 2022 was 4.14%. The greatest individual annual growth was observed for the year 2021 to 2022 with a rate of 36%. In addition,

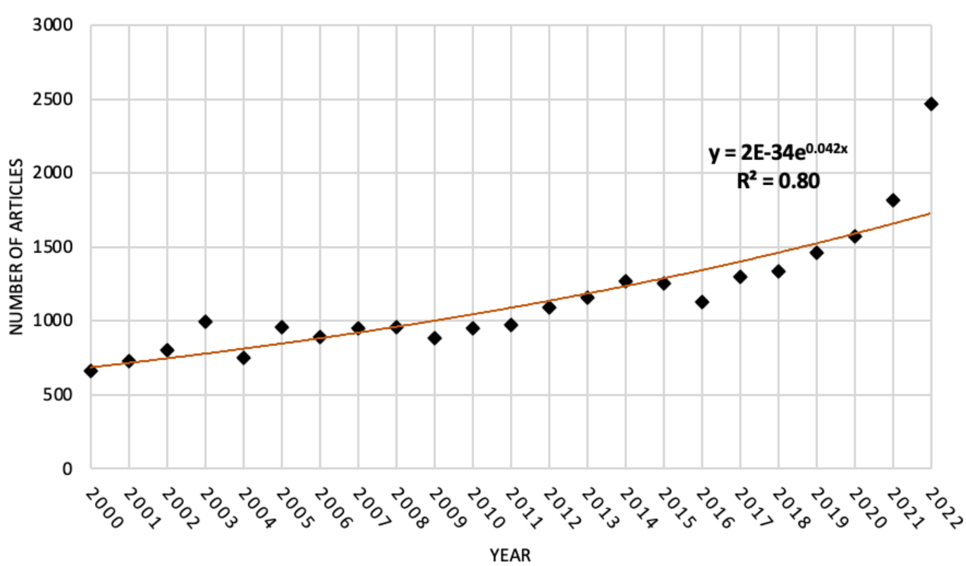


**Figure 1** Annual scientific publication of uveitis articles. The exponential adjustment of the data suggests that the growth trend follows Price's law of exponential growth.

Table 1 Publishing status of the top 10 contributing journals between 2000 and 2022, and the count and percentage of uveitis articles relative to total

| Journals | Total number of articles published in 2000–2022 | Number of uveitis articles published in 2000–2022 (%) |
|---|---|---|
| *Ocular Immunology and Inflammation* | 2941 | 1702 (57.9) |
| *American Journal of Ophthalmology* | 9740 | 750 (7.7) |
| *Clinical and Experimental Rheumatology* | 7009 | 750 (10.7) |
| *Ophthalmology* | 10509 | 578 (5.5) |
| *The British Journal of Ophthalmology* | 9465 | 549 (5.8) |
| *Retina* | 7270 | 538 (7.4) |
| *Indian Journal of Ophthalmology* | 7638 | 443 (5.8) |
| *Eye* | 8173 | 376 (4.6) |
| *International Ophthalmology* | 3704 | 363 (9.8) |
| *Graefe's archive for clinical and experimental ophthalmology* | 6686 | 341 (5.1) |

the average monthly number of publications in 2022 compared with 2021 was higher (166 publications vs 205 publications).

Applying Bradford Law, we obtained the distribution of articles per Bradford zone. We observed that out of 2337 contributing journals, only 17 journals make up zone 1. Specifically, the 17 journals in the zone 1 contribute to approximately 33.1% (8696) of the articles analysed, with a main number of 511 articles per journal. In comparison, journals in zone 2 and zone 3 have a mean number of 73 and 4 articles per journal, respectively. This suggested that the highest percentage of scientific peer-reviewed publications on the topic of uveitis was concentrated in a small number of journals. The detailed journal distribution for Bradford's zones are shown in online supplemental table S2. Notably, the top three journals that had the highest contributions are the *Ocular Immunology and Inflammation* (UK, 1852, 7.02%), *Clinical and Experimental Rheumatology* (Italy, 770, 3.01%) and *American Journal of Ophthalmology* (USA, 759, 2.90%). Table 1 depicts a summary of the publication information for each of the top 10 most productive journals. Specifically, the table shows the number of articles published by each of the journals between 2000 and 2022 and a column showing the number and ratio of uveitis articles published relative to the total number of articles published for each journal.

The two most cited publications, based on all data retrieved from only the MEDLINE database were 'Standardisation of Uveitis Nomenclature for Reporting Clinical Data. Results of The First International Workshop.' by Jabs *et al* (2748 citations), 'Effects of Ain457, A Fully Human Antibody to Interleukin-17a, on Psoriasis, Rheumatoid Arthritis and Uveitis.' by Hueber *et al* (694 citations).[22 23]

There were in total 52098 authors that contributed to the collection of articles, 2.5% (1330) of which were single-author publications. The average number of coauthors for multiauthored papers was five. After applying the Lotka's law, it was observed that the distribution of them was heavily concentrated in groups who had published fewer articles. The total number of authors for 26296 articles was 52 258, indicating a coauthorship index of approximately 2.0. Furthermore, most authors, 57% (29 589) have published only one article on record and only 4% of the authors (228) published more than 10 articles. The detailed results for Lotka's Law are shown in online supplemental table S3. Notably, the most (280, 1.1%) and second most productive (270, 1.0%) individual authors, were affiliated with The First Affiliated Hospital of Chongqing medical University, China and Massachusetts Eye Research and Surgery institution, the USA, respectively. Furthermore, based on the corresponding author's affiliated institutions, Istanbul University, Turkey, Yonsei University College of Medicine, Korea and The First Affiliated Hospital of Chongqing medical University, China produced the highest number of articles.

According to the corresponding author's countries, the three most productive countries were Turkey (3288, 12.6%), the USA (3136, 12%) and Japan (1981, 7.6%). Other countries, except China (1468, 5.6%), contributed to no more than 5% of the publications overall.

The average MCP ratio for all countries was 2.5%. The countries that had the highest MCP in the top fifty most contributing countries were Switzerland (13%), Singapore (16.5%), Thailand (15.5%), Sweden (9.8%) and Argentina (15.2%). The only two countries in the ten highest production countries that had an MCP ratio greater than 5% were China (8.2%) and France (6%). Table 2 shows the top 25 most productive countries with their publishing statistics.

The collaboration map showed that USA is situated as the main collaborating country (purple), with a high number of collaborations between greatest number of countries (figure 2).

In table 1, the health spending in USA dollars per capita of each of the top 25 most productive countries from 2020 are shown. Specifically for the top three

**Table 2** The top 25 most productive countries with their corresponding publication statistics and annual public health spending in order of productivity based on number of publications

| Country | Articles | SCP | MCP | Frequency | MCP ratio | Per capita health expenditure (USD) |
|---|---|---|---|---|---|---|
| Turkey | 3288 | 3232 | 56 | 0.126 | 0.017 | 395 |
| USA | 3136 | 2992 | 144 | 0.12 | 0.046 | 11 702 |
| Japan | 1981 | 1948 | 33 | 0.076 | 0.017 | 4388 |
| China | 1468 | 1347 | 121 | 0.056 | 0.082 | 583 |
| India | 1227 | 1162 | 65 | 0.047 | 0.053 | 57 |
| Italy | 981 | 927 | 54 | 0.037 | 0.055 | 3057 |
| Korea | 973 | 963 | 10 | 0.037 | 0.01 | 3580 |
| France | 662 | 622 | 40 | 0.025 | 0.06 | 4796 |
| Spain | 628 | 589 | 39 | 0.024 | 0.062 | 2901 |
| UK | 623 | 593 | 30 | 0.024 | 0.048 | 4927 |
| Germany | 529 | 500 | 29 | 0.02 | 0.055 | 5930 |
| Brazil | 403 | 382 | 21 | 0.015 | 0.052 | 701 |
| Tunisia | 302 | 291 | 11 | 0.012 | 0.036 | 222 |
| Australia | 296 | 274 | 22 | 0.011 | 0.074 | 5901 |
| Netherlands | 286 | 257 | 29 | 0.011 | 0.101 | 5849 |
| Switzerland | 285 | 248 | 37 | 0.011 | 0.13 | 10 310 |
| Iran | 262 | 246 | 16 | 0.01 | 0.061 | 573 |
| Israel | 239 | 227 | 12 | 0.009 | 0.05 | 3867 |
| Egypt | 225 | 209 | 16 | 0.009 | 0.071 | 151 |
| Singapore | 212 | 177 | 35 | 0.008 | 0.165 | 3537 |
| Canada | 197 | 188 | 9 | 0.008 | 0.046 | 5619 |
| Saudi Arabia | 191 | 164 | 27 | 0.007 | 0.141 | 1198 |
| Greece | 183 | 178 | 5 | 0.007 | 0.027 | 1675 |
| Portugal | 124 | 115 | 9 | 0.005 | 0.073 | 2342 |
| Morocco | 110 | 109 | 1 | 0.004 | 0.009 | 187 |

Note: SCP and MCP correspond to the number of single country collaborations and multi-country collaborations of each country, respectively. Frequency denotes the percentage that each country contributed to the total number of published articles. MCP ratio represents the ratio between the MCP count and total number of publications for each country. Per capita health expenditure corresponds to the per capita health expenditure of each country reported in USA dollars.
Per capita health expenditure data obtained from the WHO's Global Health Expenditure Database.[21]
MCP, multicountry publication; SCP, single-country publication.

countries, namely Turkey, USA and Japan, the per capita health expenditure from 2020 are reported to be US$395, US$11 702 and US$4388, respectively.

Analysis on keyword co-occurrences was performed by constructing a network graph, which is shown in figure 3. In online supplemental table S4, the most frequently indexed keyword for general terms was 'humans' with 17515 occurrences, for Imaging/diagnostic terms the most frequently indexed term was 'fluorescein angiography' with 2123 occurrences s, for treatment terms it was 'glucocorticoids/therapeutic use' with 1082 uses, for disease terms it was 'uveitis' with 1215 occurrences and finally, the most frequently occurring study term was 'retrospective study' with 3156 occurrences.

## Discussion

This bibliometric analysis aimed to comprehensively review the landscape of the uveitis literature published and catalogued in three influential databases. Various aspects of the datasets were analysed to explore publishing trends, demographic features and productivity of research institutions and countries worldwide. Our findings suggest that the field of uveitis studies has undergone a significant growth in the past two decades, with the past year, 2022 having the highest annual growth. We found that the majority of published articles are concentrated around a few countries. The most productive authors were noted to be affiliated with institutions in China and the USA, while the most productive institution based on corresponding authors' affiliation was in Turkey. Indeed, we found that Turkey had the highest number of published articles while the

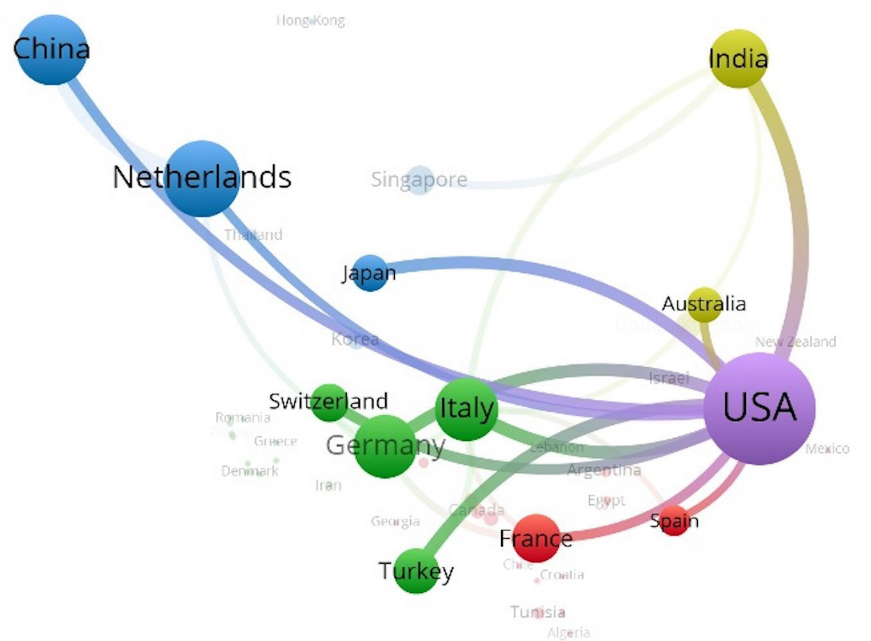


**Figure 2** A representative figure demonstrating the publishing collaborations between various countries. Note: The size of each circle represents the frequency of the country's collaboration, and the more collaboration the country has with others, the bigger the circle for that country. The colour of the circles denotes the cluster in which the country belongs to, which there are in total five clusters with the USA being the highest collaboration cluster with the colour purple. The distance between countries indicates the relatedness of the countries from cocitation links, and the closer two countries are, the stronger the collaborations between the two.

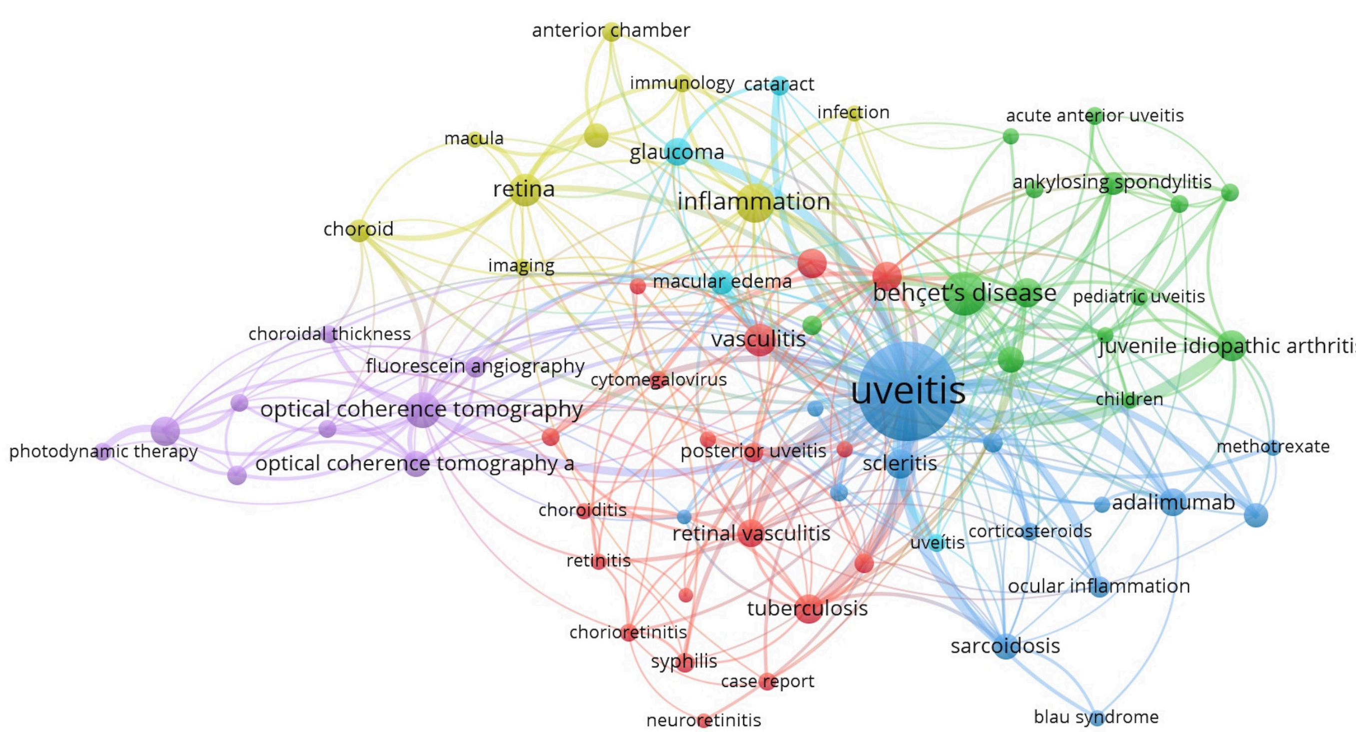


**Figure 3** A keyword co-occurrence network graph showing the most frequently referenced terms in uveitis publications. Note: The size of each circle represents the frequency of occurrence of the term with larger circle representing higher frequency. The colour of a term denotes one of the six clusters to which the term belongs. The distance between terms indicates the relatedness of the terms from co-occurrence links, and the closer two terms are, the stronger the connections between the two.

USA had the highest number of published clinical trials. Countries that had the highest multicountry collaboration ratios were the ones that ranked relatively low in the order of the number of studies published. Furthermore, we have identified the most used terminologies from the articles from the author's keywords and categorised them into five different groups. These trendy keywords in categories such as imaging/diagnostic and treatment may be predictive indicators of where the field is evolving toward and may be referenced by prospective scholars.

Between 2000 and 2022, the growth of uveitis literature may be described by an exponential model, which follows Price's Law.[20] From 2000, the greatest individual annual growth was observed for the year 2022 with a rate of 36%. In addition, there is an exponential increase in annual publication number from 2000 to 2021. The observed trend may be explained as a result of multiple interrelated factors. Due to the diverse etiological nature of uveitis, its possible clinical complications and our enhanced understanding of the condition may be some of the possible factors for the advancement in the diagnosis and prognostics for uveitis in the past years.[24–26] In their bibliometric study in ocular drug delivery, Peng *et al* reported an exponential growth of 746.15% in publications from 2002 to 2020.[27]

There have been a growing number of RCTs published regarding new treatments for uveitis. Tsui *et al* in their RCT 'Outcomes of Uveitic Macular Oedema in the First-line Antimetabolites as Steroid-Sparing Treatment Uveitis Trial' evaluated the efficacy of using methotrexate to treat patients with uveitic macular oedema.[28] Another RCT conducted by Rathinam *et al*, 'Effect of Corticosteroid-Sparing Treatment with Mycophenolate Mofetil vs Methotrexate on Inflammation in Patients with Uveitis' compared methotrexate with similar drugs such as mycophenolate mofetil and showed that the methotrexate-treated group had a greater recovery percentage.[29] In our bibliometric analysis, we noted that on record, there were 356 protocols submitted for clinical trials from years 2021 and 2022. This is an indication that this area of study is further growing and that there are more RCTs that are expected to be published in the coming years.

Bradford's law states that for any given field of study, the core productivity is concentrated around fewer journals.[18] Our findings agree with Bradford zone's model and show that majority articles are published by three journals. Lotka's law assesses authors' distribution based on publication counts, and as expected, we conclude that most of the authors are small producers and have published less than 10 articles.[19] This may further suggest that in the field of uveitis study, most authors do not specialise in this single area alone. We also noted that the most productive authors are not affiliated with the most productive institutions. This may suggest that collaborations between authors may play a critical role in publishing articles.

Turkey, the USA and Japan have the highest account of uveitis publications and together consist of more than 40% of the total publications. Interestingly, we observed that Turkey is the most productive country, and its gross number of publications is almost double that of the second most productive country, the USA. This is a novel finding, especially when considering this finding with the previously reported positive correlation between countries' research production and their public health spending. Specifically, prior studies have reported that a higher per capita health spending tend to be correlated with a higher research production for a country.[30–32] It is thus striking to see that Turkey, with a per capita health expenditure almost 27-fold lower than that of the USA and 10-fold lower than that of Japan, have the highest literature production in the field of uveitis. We hypothesise that this phenomenon is a result of a country-specific disease burden. Prior studies have discussed the influence of disease burden on publication trends in various countries, and that more prevalent disease will be reported on more frequently and have a higher priority.[33] Turkey has been shown to have a large uveitis patient population and thus a larger pathology sample size to be studied and reported in this field.[34] Notably, this observation in productivity, however, is not found in articles that are labelled as clinical trials. It was found that the USA is the most productive country in publishing clinical trials for various uveitis-related treatments. This observation is similar to that of various prior bibliometric analyses in ophthalmology.[35–38] This observation may be partially explained by the relative fundings and developmental policies in scientific research, which has been previously suggested in other bibliometric studies.[15] In their paper on glaucoma bibliometric analysis, López-Muñoz *et al* concluded that the USA contributed to the highest per cent of documents and suggested that there may be a correlation between a country's research production and their scientific research policy.[15] It is plausible that developed countries have more resources such as research facilities and funding support. In fact, prior studies have discussed the correlation between funding support for clinical research and publication productivity.[39–41]

Collaborations in research is another crucial contributing factor for productivity. In our study, more than 94% of the collected articles were multi-authored. Previous bibliometric studies have found that the concept of coauthorship and collaboration is beneficial for multiple reasons, such as increased data accessibility and availability.[42] As international collaborations become more frequent in the scientific field, examining the collaboration network for countries may provide several meaningful insights.[43] First, we observed that countries that have the highest scientific production do not have the highest international collaboration rate. For example, the three most productive countries in this field, Turkey, the USA and Japan only have international collaboration ratios (MCP) of 1.7%, 4.6% and 1.7%. Indeed, none of the ten most productive countries has an MCP of more than 10%. On the other hand, we noted that the most internationally collaborative countries tend to be smaller countries in Europe, South America, South Asia and Africa. This may be associated with the limited medical resources in smaller countries, and that these countries may collaborate with more developed medical systems to publish medical articles. Alternatively, as previously reported in studies analysing the global patterns of scholar migrations, it has also been observed that researchers tend to have incentives to migrate to countries with more academic opportunities and resources.[44] Subsequently, these researchers are also more likely to maintain international collaborative networks with their institution.[44] Gathering the above observations together, we see an inverse relationship between a country's international collaboration rate and its productivity.

Performing a keyword network analysis in this bibliometric study allowed further exploration in the relationships and connections between different articles based on shared keywords. It was anticipated that imaging and diagnostic terms, such as "fluorescein angiography" and "optical coherence tomography," commonly used in the assessment of uveitis and other inflammatory ocular diseases, would be prevalent in the data. Similarly, in the treatment terms category, terms such as glucocorticoids and infliximab were commonly observed based on the relevance of these treatments and ongoing research in these areas.[45–47]

## Limitations

The authors would like to acknowledge the limitations of this bibliometric analysis. First, we have collected uveitis related publications from three of the most relevant databases, and despite their inclusivity, there are publications that were not captured from other databases. Our aim when selecting databases was to capture relevant data while maintaining software compatibility and manageability of the dataset sizes. The specific three databases were chosen as they encompass a wide selection of articles pertaining to the selected topics and are thought to be more clinically relevant. Although we did not set a restriction on publication language, due to the nature of the databases, the documents included in this study may only be representative of those published in English. Furthermore, we have focused our analysis on the corresponding authors' affiliated institutions and countries based on previously established methods in bibliometric studies.[48]

### Conclusions

In conclusion, our present study presents a bibliometric analysis and mapping of uveitis research literature in the past two decades. We examined the fundamental bibliographic, demographic characteristics and additional interesting trends of the field. Publications in uveitis research has grown significantly in the past two decades, with the largest annual growth being the year 2022. We found that the majority of published articles are concentrated around a few countries. Turkey is the most productive country overall while the USA contributed to the highest number of clinical trials. We have also found extensive research collaborations both within and between countries, and the overall productivity of a country tend to be inversely associated with its international collaboration rate. By mapping and identification of most shared keywords among articles, we further provided an insight into the patterns of research topics and collaborations. Our finding contribute not only to the field of uveitis, but also to the general field of ophthalmology research by providing an insight into the dynamic landscape of research.

**Contributors** TF designed the study. TG and HM performed the analysis. TG drafted the initial manuscript. All authors contributed to the manuscript and reviewed the final draft. TF is responsible for overall content as the guarantor.

**Funding** This work was supported by the Fighting Blindness Canada Clinician Scientist Emerging Leader Award given to Dr. Tina Felfeli and the Toronto Western Hospital, University Health Network Foundation.

**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Ethics approval** Ethics approval from the institutional review board was not required as this is a systematic review of published studies and does not involve human subjects.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request. Data is available upon request sent to the corresponding author.

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**Supplementary table 1.** Specific search strategies used for each database

| **Database** | **Search strategy** |
|---|---|
| **MEDLINE** | Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE® <1946-Present><br><br>1 *retinal vasculitis/ or *retinitis/ or *chorioretinitis/ or *scleritis/ or *uveal diseases/ or *choroid diseases/ or *choroiditis/ or *birdshot chorioretinopathy/ or *multifocal choroiditis/ or *pars planitis/ or *iridocyclitis/ or *iritis/ or *uveitis/ or *panuveitis/ or *uveitis, anterior/ or *behcet syndrome/ or *uveitis, posterior/ or *white dot syndromes/ or *uveitis, intermediate/ 33073<br>2 exp animals/ not humans.sh. 5006281<br>3 1 not 2 30361<br>4 limit 3 to yr="2000 -Current" 17903<br>5 limit 4 to english language 15962 |
| **Embase** | Embase Classic+Embase<br><br>1 *retina vasculitis/ or *retinitis/ or *chorioretinitis/ or *scleritis/ or *choroiditis/ or *birdshot chorioretinopathy/ or *multifocal choroiditis/ or *intermediate uveitis/ or *iridocyclitis/ or *iritis/ or *uveitis/ or *iridocyclitis/ or *behcet disease/ or *white dot syndrome/ or *uveitis, intermediate/ [****Original MeSH terms - EMBASE indexing****] 38357<br>2 *exudative retinitis/ or *uveoretinitis/ or *autoimmune uveitis/ or *vogt koyanagi syndrome/ or *blau syndrome/ or *keratouveitis/ or *uveoretinitis/ or *iridocyclitis/ [***Possible EMBASE terms not used in MEDLINE as MeSH terms****] 6756<br>3 1 or 2 41346<br>4 exp animal/ not exp human/ 5738001<br>5 3 not 4 38422<br>6 limit 5 to yr="2000 -Current" 21968<br>7 limit 6 to english language 19677<br>8 limit 7 to (conference abstract or conference paper or "conference review") 3554<br>9 7 not 8 16123 |
| **Cochrane** | ID Search Hits<br>#1 MeSH descriptor: [Retinal Vasculitis] this term only 12<br>#2 MeSH descriptor: [Retinitis] this term only 95<br>#3 MeSH descriptor: [Choroiditis] explode all trees 50<br>#4 MeSH descriptor: [Scleritis] this term only 13<br>#5 MeSH descriptor: [Uveal Diseases] this term only 10<br>#6 MeSH descriptor: [Choroid Diseases] this term only 38<br>#7 MeSH descriptor: [Chorioretinitis] explode all trees 22<br>#8 MeSH descriptor: [Birdshot Chorioretinopathy] this term only 0<br>#9 MeSH descriptor: [Multifocal Choroiditis] this term only 0<br>#10 MeSH descriptor: [Pars Planitis] this term only 22<br>#11 MeSH descriptor: [Iridocyclitis] this term only 30<br>#12 MeSH descriptor: [Iritis] this term only 22<br>#13 MeSH descriptor: [Uveitis] this term only 283 |

| | |
|---|---|
| | #14 MeSH descriptor: [Panuveitis] this term only 33<br>#15 MeSH descriptor: [Uveitis, Anterior] this term only 166<br>#16 MeSH descriptor: [Behcet Syndrome] this term only 135<br>#17 MeSH descriptor: [Uveitis, Posterior] this term only 58<br>#18 MeSH descriptor: [White Dot Syndromes] this term only 0<br>#19 MeSH descriptor: [Uveitis, Intermediate] this term only 42<br>#20 {or #1-#19} with Cochrane Library publication date Between Jan 2000 and Current 612 |

**Supplementary table 2.** Distribution of journals in Bradford's zones.

| Bradford Zone | No. of Journals | No. of Articles | % of Journals | Mean No. of Articles |
|---|---|---|---|---|
| 1 | 17 | 8696 | 7.27 | 511 |
| 2 | 115 | 8428 | 4.92 | 73 |
| 3 | 2226 | 8321 | 9.53 | 4 |
| Total | 2337 | 26195 | 100 | 11 |

**Supplementary table 3.** Distribution of authors' publishing status by number of articles published

| No. of articles published | No. of authors | Observed proportion of authors |
|---|---|---|
| 1 | 29589 | 0.566 |
| 2 | 11890 | 0.228 |
| 3 | 3398 | 0.065 |
| 4 | 2109 | 0.04 |
| 5 | 1100 | 0.021 |
| 6 | 888 | 0.017 |
| 7 | 573 | 0.011 |
| 8 | 421 | 0.008 |
| 9 | 304 | 0.006 |
| 10 | 228 | 0.004 |

**Supplementary table 4.** The top 10 most frequently indexed keywords in the five categories of general terms, imaging terms, treatment terms, disease terms and types of study.

| | |
|---|---|
| **General Terms:** | |
| • humans | 17515 |
| • male | 10623 |
| • female | 10247 |
| • adult | 8319 |
| • middle aged | 6885 |
| • aged | 3543 |
| • adolescent | 2838 |
| • young adult | 2110 |
| • child | 2038 |
| • aged 80 and over | 1169 |
| **Imaging/diagnostic Terms:** | |
| • fluorescein angiography | 2123 |
| • tomography optical coherence | 1560 |
| • magnetic resonance imaging | 555 |
| • fluorescein angiography/methods | 504 |
| • tomography x-ray computed | 388 |
| • indocyanine green | 358 |
| • ultrasonography | 304 |
| • biopsy | 254 |
| • coloring agents | 248 |
| • biomarkers/blood | 213 |
| **Treatment Terms:** | |
| • glucocorticoids/therapeutic use | 1082 |
| • drug therapy combination | 769 |
| • infliximab | 451 |
| • anti-inflammatory agents | 412 |
| • vitrectomy | 319 |
| • anti-bacterial agents | 259 |
| • adalimumab | 208 |
| • prednisone/therapeutic use | 53 |
| • lens implantation intraocular | 39 |
| • phacoemulsification | 33 |
| **Disease Terms:** | |
| • behcet's | 1804 |
| • uveitis | 1215 |
| • acute disease | 672 |
| • chronic disease | 458 |
| • disease progression | 393 |
| • retina/pathology | 289 |
| • choroid/pathology | 288 |
| • inflammation | 285 |
| • choroid diseases/diagnosis | 277 |
| • Behcet syndrome | 254 |
| **Types of Study:** | |
| • Retrospective studies | 3156 |

| | |
|---|---|
| • prospective studies | 1071 |
| • follow-up studies | 1757 |
| • case-control studies | 937 |
| • cross-sectional studies | 475 |
| • cohort studies | 311 |
| • double-blind method | 207 |
| • surveys and questionnaires | 197 |
| • risk assessment | 159 |
| • clinical trials as topic | 109 |

*Note: The five main keyword categories were selected by authors. Based on the themes of the terms identified within each category, the top ten terminologies are selected. The terms within each category appear in the order of highest to lowest occurrence.*