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Bibliometric analysis of publications on osteoarticular brucellosis

Cihan Semet

Department of Infectious Diseases and Clinical Microbiology, TR Ministry of Health, İnegöl State Hospital, Bursa, Turkey

ABSTRACT

Objectives: The aim of this investigation was to undertake a thorough bibliometric analysis of publications between 1991 and 2022 to scrutinize and comprehend the research landscape of osteoarticular brucellosis, a zoonotic infection that affects bones and joints.

Methods: We scrutinized the distribution of publications by various criteria, including country, institution, author, and journal. Furthermore, we executed citation analysis, established collaboration networks, and performed keyword co-occurrence analysis.

Results: Our examination discovered 432 documents on this topic indexed in the Web of Science database, with a noticeable surge in publications over time. Turkey, the United States, and Iran were the leading nations in terms of research output. The University of Buenos Aires emerged as the most productive institution. The primary research areas were General Internal Medicine, Infectious Diseases, and Rheumatology. The primary beneficiary of this research was Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT).

Conclusions: This study furnishes valuable insights into worldwide research endeavors on osteoarticular brucellosis. These insights can steer future research directions, emphasizing the necessity for sustained collaboration and funding support to tackle this significant public health issue.

Keywords: Osteoarticular brucellosis, bibliometric analysis, web of science database

The Brucella species causes a zoonotic infection known as brucellosis which presents itself in various forms including osteoarticular brucellosis that affects bones and joints leading to arthritis, spondylitis or even osteomyelitis [1, 2]. In light of its growing prevalence rates infectious diseases specialists need to carry out thorough analyses of available literature regarding research trends and knowledge gaps [3, 4]. This form presents unique challenges when it comes to diagnosis, treatment and prevention hence necessitating advanced comprehension through continued research efforts backed by relevant stakeholders. The study delves into bibliometric analysis from publications made between 1991-2022 spanning multiple geographies institutions documenting authorship roles played across different journals while revealing new insights into global research efforts centred around Osteoarticular Brucellosis.

In addition, analysts have applied tactics like citation analysis, collaboration networks, and keyword co-occurrence analysis to clarify ongoing research themes as well as possible areas where additional knowledge is required.

Corresponding author: Cihan Semet, MD.,
Phone: +90 224 715 17 15, E-mail: semetcihan@gmail.com

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METHODS

In this bibliometric search, we gathered information from the Web of Science (WoS) database (Clarivate Analytics, Philadelphia, PA, USA) to obtain the information "osteoarticular" and "brucellosis," "bone and joint" and "brucellosis," "brucellosis and arthritis," "brucellosis and osteoarticular manifestations," "brucellosis and bursitis," and "brucellosis and tenosynovitis." We conducted these searches on titles, descriptions, keywords, and WoS with KeyWords Plus. We saved titles, document types, publication years, authors, organizations, keywords, abstracts of each record, H-index, and citations in WoS publications as TXT files.We imported them into Microsoft Office Excel 2023 (Los Angeles, CA, USA). We received the data for this study on April 23, 2023 and the material was reviewed and analyzed.

In cases where authorship is not provided, we accept that the original work and the authors are the same. Likewise, we distributed publications from a school that was the school of the first author. For articles with more than one co-author, only the first co-author is considered. We use the address to identify the type of partnership. We analyzed the data published between 1991 and 2022, excluding the publication in 2023, as the year is not yet over.

Statistical Analysis

We use the tool VOSviewer 1.6.18 for Microsoft Windows systems to view country coordination and content. We base our data collection on data identified through advertising, e.g., country, citation and keywords).

RESULTS

Based on the search method used in this study, the findings revealed that 470 documents on this topic were indexed in the Wos database between 1991 and 2022. Three hundred eighty-three documents are articles, and 49 are review articles. We analyzed only these 432 documents.

Most publications on osteoarticular brucellosis were indexed in the Science Citation Index Expanded (SCI-Expanded), accounting for 79.06% of the total records. The Emerging Sources Citation Index (ESCI) accounted for 20.24% of the publications. A tiny percentage of publications were indexed in the Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI), with 0.47% and 0.24%, respectively. These findings emphasize that most research on osteoarticular brucellosis is concentrated in science and emerging sources, with minimal representation in social sciences and arts & humanities databases.

The most cited article on this topic was published in 1996, titled "Complications associated with Brucella melitensis infection: A study of 530 cases" by Colmenero *et al*. [2]. The most common keywords in the analyzed publications were "brucellosis," "osteoarticular involvement," "brucella," "treatment," and "epidemiology."

These findings show the distribution of publications on osteoarticular brucellosis across different years, with a general increase in publications over time. The highest number of publications was in 2019, with 7.87%. In more recent years, there has been a

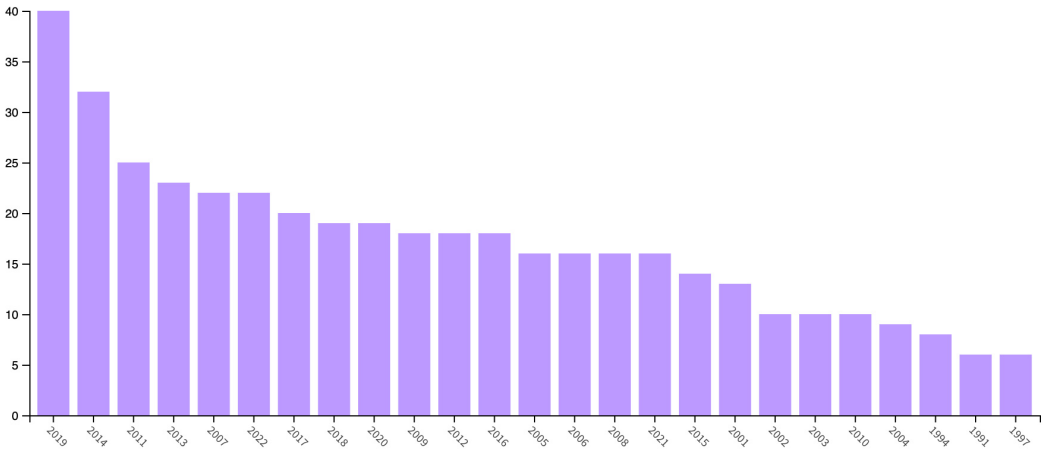

Fig. 1. The number of publications in 1991-2022.

Table 1. The top published countries

Country/Region	Record Count	% of 470
Turkey	141	30.000
USA	48	10.213
Iran	40	8.511
Peoples R China	34	7.234
Spain	32	6.809
Saudi Arabia	23	4.894
Argentina	21	4.468
India	18	3.830
Israel	11	2.340
Brazil	9	1.915
England	9	1.915
France	9	1.915
Greece	9	1.915
Tunisia	8	1.702
Australia	6	1.277
Egypt	6	1.277
Italy	6	1.277
Portugal	6	1.277
Germany	5	1.064
Peru	5	1.064
Lebanon	4	0.851
Macedonia	4	0.851
South Korea	4	0.851
Iraq	3	0.638
North Macedonia	3	0.638

Total 64 countries

slight decrease in the number of publications, with 4.68% of publications in 2022 (Fig. 1).

Table 1 presents the top published countries in osteoarticular brucellosis research. A total of 64 countries contributed to the research output. Turkey emerged as the leading country with 141 publications, accounting for 30% of the total records. The United States followed with 48 publications (10.213%), and Iran ranked third with 40 publications (8.511%). Other top publishing countries included China (7.234%), Spain (6.809%), Saudi Arabia (4.894%), Argentina (4.468%), India (3.830%), Israel (2.340%), Brazil, England, France, and Greece each with nine publications (1.915%), and Tunisia (1.702%). The remaining countries contributed fewer publications, with percentages ranging from 1.277% to 0.638%. This distribution of research output highlights the global interest in osteoarticular brucellosis and the significant contribution of countries with high brucellosis prevalence to the existing body of knowledge.

Table 2 showcases the top-ranked institutions contributing to research in osteoarticular brucellosis. A total of 619 organizations were involved in the publication of these studies. The University of Buenos Aires in Argentina led the list with 17 publications, representing 3.617% of the total records. Argentina's Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) was the second most prolific institution, with 11 publications (2.340%). Erciyes University in Turkey ranked third with ten publications (2.128%). Başkent University and Çukurova University, both from Turkey, followed with nine publications each (1.915%). Other leading institutions included Babol University of Medical Sciences in Iran, Hospital Carlos Haya in Spain, and Tehran University of Medical Sciences in Iran, each with eight publications (1.702%). Dicle University and Gaziantep University, located in Turkey, contributed seven publications each (1.489%). These findings highlight the significant role of various institutions in advancing research on osteoarticular brucellosis, with a strong representation of Turkish and Argentine institutions among the top contributors.

Table 3 displays the distribution of publications on osteoarticular brucellosis across various research areas. A total of 49 research areas were covered in the analysis, with the top 10 areas presented in the table. General Internal Medicine was the most represented research area with 109 publications (23.191%), followed closely by Infectious Diseases, accounting for 101 publications (21.489%). Rheumatology came in third with 67 publications (14.255%). Other significant research areas included Immunology and Microbiology, each with 51 publications (10.851%), Pediatrics with 39 publications (8.298%), Tropical Medicine with 24 publications (5.106%), Veterinary Sciences with 22 publications (4.681%), Orthopedics with 20 publications (4.255%), and Public Environmental Occupational Health with 19 publications (4.043%). These findings demonstrate the interdisci-

Table 2. **The top ranked institutions**

Institutions, Country	Record Count	% of 470
University of Buenos Aires	17	3.617
Consejo Nacional de Investıgacıones Cientificas Y Tecnicas Conicet	11	2.340
Erciyes University	10	2.128
Baskent University	9	1.915
Cukurova University	9	1.915
Babol University of Medical Sciences	8	1.702
Hospital Carlos Haya	8	1.702
Tehran University of Medical Sciences	8	1.702
Dicle University	7	1.489
Gaziantep University	7	1.489

Total 619 organizations

plinary nature of osteoarticular brucellosis research, emphasizing the involvement of various medical fields in understanding and addressing this condition.

Table 4 lists the top funding agencies supporting research in osteoarticular brucellosis. Out of 114 funding agencies identified, ten are shown in the table, while 387 records (82.340%) did not have data available for analysis. The Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT) from Argentina was the leading funder with 16 publications (3.404%). The National Institutes of Health (NIH) in the United States and the United States Department of Health and Human Services both supported 13 publications each (2.766%). Argentina's Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) funded 12 publications (2.553%), and the National Natural Science Foundation of China (NSFC) supported nine publications (1.915%). Other notable funders included the University of Buenos Aires (1.277%), Brazil's Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) (1.064%), the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) in Brazil (0.851%), the National Institute of Allergy and Infectious Diseases (NIAID) in the United States (0.851%), and the University of Missouri College of Veterinary Medicine and Research Board (0.851%). This highlights the critical role of various funding agencies in promoting and advancing osteoarticular brucellosis research worldwide.

Table 5 and fig. 2 summarizes citations, H-indexes, and the number of publications in osteoarticular brucellosis research across different periods. From 1991 to 2000, 46 publications received 1,621 citations and 1,583 without self-citations. The average number of citations per publication was 35.24, and the H-index for this period was 19. Between 2000 and 2009, the number of publications increased to 135, with 3,113 total citations, 2,939 citations without self-citations, and an average of 23.06 citations per publication. The H-index for this time span was 31.

In the following decade, 2010-2019, there were 219 publications with 2,738 total citations, 2,325 ci-

Table 3. **Research areas**

Research Area	Record Count	% of 470
General Internal Medicine	109	23.191
Infectious Diseases	101	21.489
Rheumatology	67	14.255
Immunology	51	10.851
Microbiology	51	10.851
Pediatrics	39	8.298
Tropical Medicine	24	5.106
Veterinary Sciences	22	4.681
Orthopedics	20	4.255
Public Environmental Occupational Health	19	4.043

Showing 10 out of 49 entries

Table 4. **Funding agencies**

Funding Agency	Record Count	% of 470
Agencia Nacional de Promoción Científica y Tecnológica	16	3.404
National Institutes of Health	13	2.766
United States Department of Health Human Services	13	2.766
Consejo Nacional de Investigaciones Cientificas Y Tecnicas Conicet	12	2.553
National Natural Science Foundation of China	9	1.915
University of Buenos Aires	6	1.277
Conselho Nacional de Desenvolvimento Cientifico E Tecnologico	5	1.064
Fundacao de Amparo a Pesquisa do Estado de Minas Gerais	4	0.851
National Institute of Allergy Infectious Diseases	4	0.851
University of Missouri College of Veterinary Medicine and Research Board	4	0.851

Showing 10 out of 114 entries; 387 record(s) (82.340%) do not contain data in the field being analyzed.

Table 5. **The summary of citations, H indexes, and the number of publications**

Time span	No. of publications	Total citations	Citations without self-citations	Citations average per	H-Index
1991-2000	46	1,621	1,583	35.24	19
2000- 2009	135	3,113	2,939	23.06	31
2010-2019	219	2,738	2,325	12.5	27
2019-2022	97	298	260	3.07	9

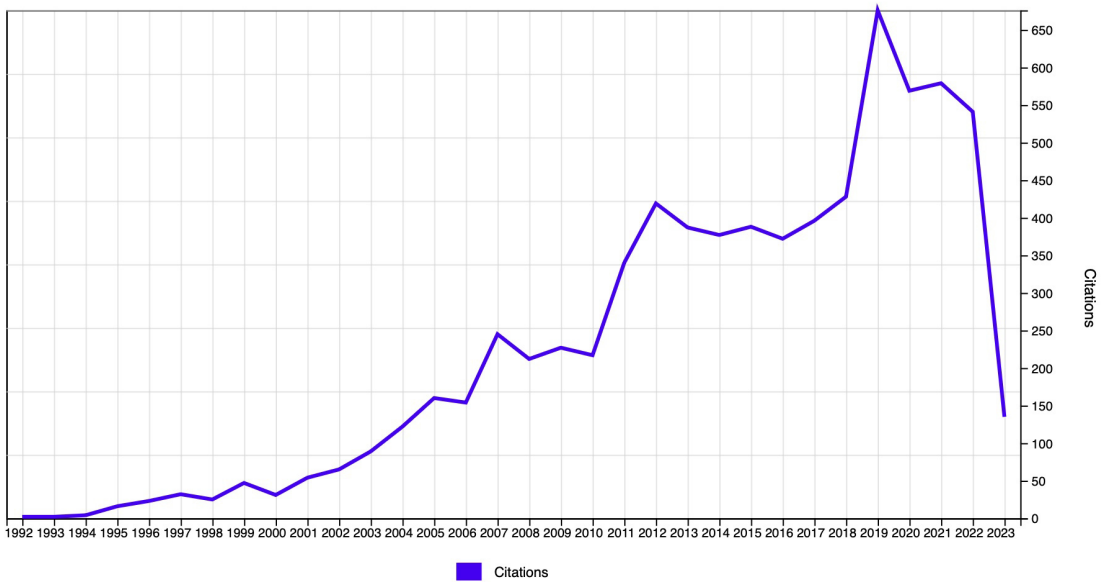

Fig. 2. **The number of citations over the years.**

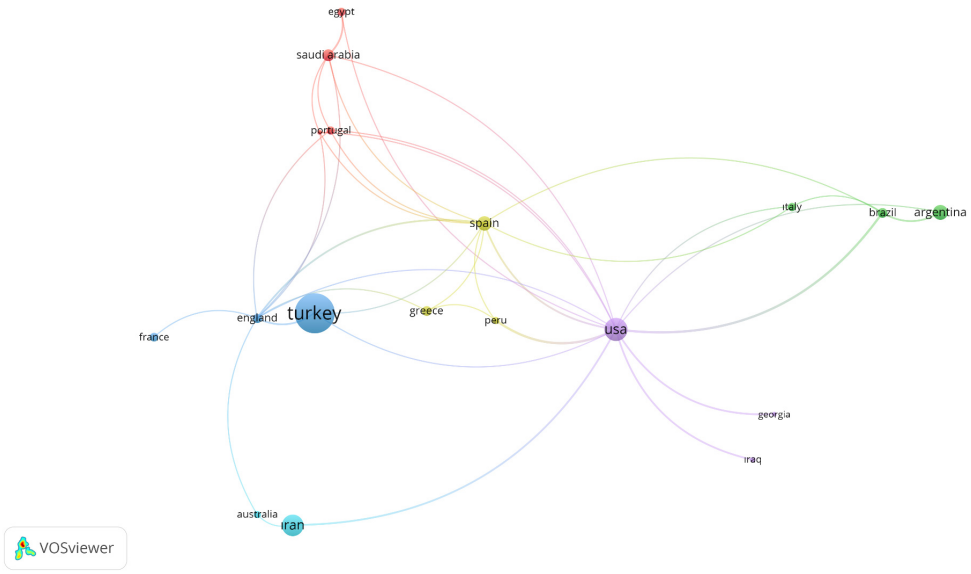

Fig. 3. **Co-authorship (Countries).**

tations without self-citations, and an average of 12.5 citations per publication. The H-index for this period was 27. From 2019 to 2022, 97 publications garnered 298 total citations and 260 citations without self-citations. The average number of citations per publication was 3.07, and the H-index was 9. This table illustrates the growth in osteoarticular brucellosis research over time and the impact of these publications as measured by citations and H-indexes. The mapping analysis of the documents is given in Figs. 3-5.

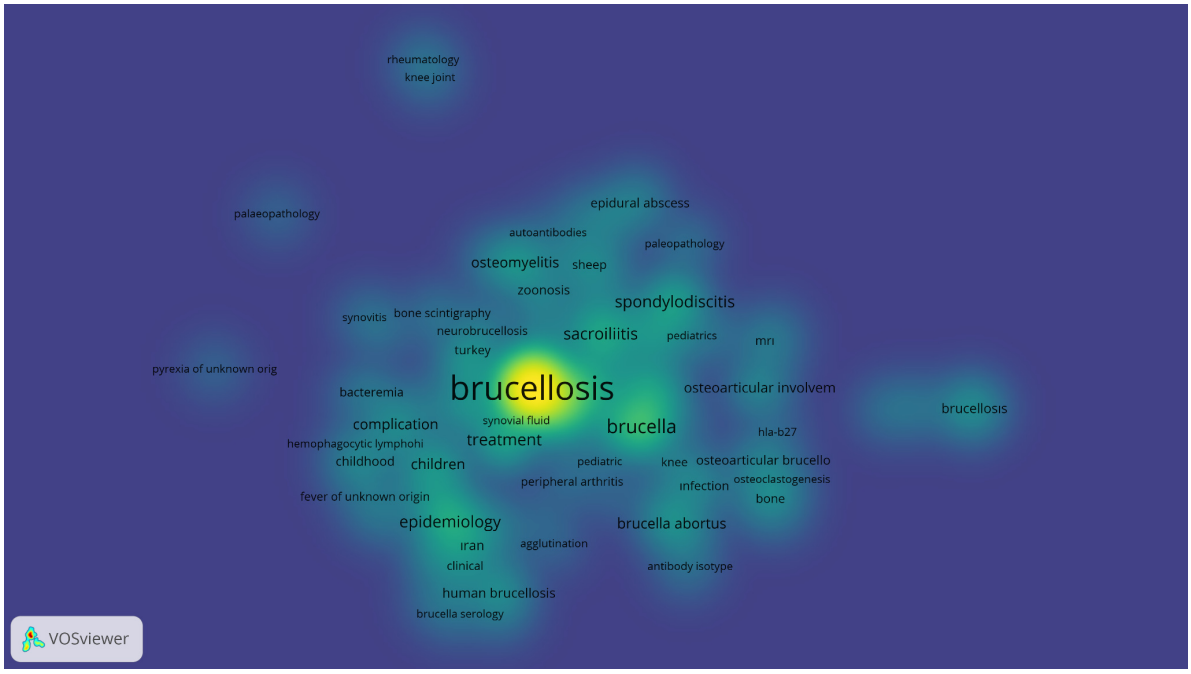

Fig. 3. **Keyword co-occurrence.**

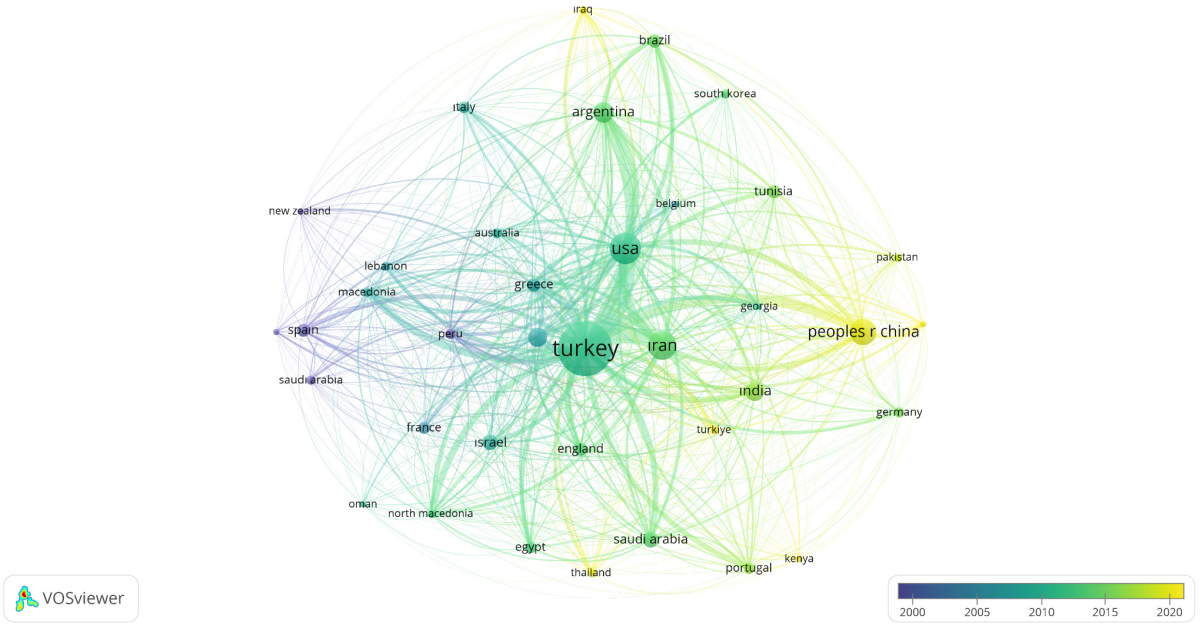

Fig. 5. **Bibliographic coupling of countries according to citations.**

DISCUSSION

Bibliometric research has become more and more known in the context of classification, knowledge and quality of work of different disciplines, especially within the medical literature in recent years [5, 6]. Researchers from numerous countries, including ours, have significantly contributed significantly to this area [7]. The scientific literature can be systematically evaluated by employing bibliometric analyses, offering valuable insights to researchers in the relevant fields (8). Some databases, such as Elsevier's Scopus database [9], Web of Science Core Collection (WoSCC) [10], and PubMed Medline [11] have used various bibliometric studies. In the current view, the WoSCC database was chosen because its comprehensive range of journal content and is suitable for extensive research [12].

The bibliometric analysis of the distribution of osteoarticular brucellosis from 1991 to 2022 shows several highlights of regional trends. Long-term interest in questioning outcomes is widespread, reflecting awareness of the importance of osteoarticular brucellosis as a zoonotic disease and its global impact on public health [1]. However, the slight decline in the number of publications in 2022 (4.68%) calls for renewed efforts in research and funding to address this disease effectively. The reason for this decrease in the number of publications may be the concentration of scientific research in this field due to the COVID-19 pandemic.

The main points of keyword co-occurrence analysis indicate that osteoarticular brucellosis research mainly focuses on proposed strategies, treatment-modalities and epidemiology. However, more research is needed on the principles of osteoarticular brucellosis and the development of new treatments.

The best of osteoarticular brucellosis research demonstrates collaborative research between important different disciplines, as evidenced by the combination of disparate materials such as internal medicine, infectious diseases, rheumatology, immunology, and microbiology. This collaboration provides a better understanding of disease etiology, pathogenesis, and clinical symptoms and illuminates advances in symptoms and treatment strategies [3].

The geographical distribution of studies investigating the occurrence of osteoarticular brucellosis have shown that countries with high brucellosis rates such as Turkey, United States, and Iran are responsible for the already existing knowledge. This finding fits well with the previous notion that these countries have a heavy burden of brucellosis and funding research to address this health proble [13].

The review also highlights the important role of different funding agencies in advancing and improving osteoarticular brucellosis research. Cash support is essential for us to better understand the disease and develop effective ways to prevent it. It is worth noting that Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT), National Institutes of Health (NIH) and the United States Department of Health and Human Services are the main funding agencies [14].

Limitations

The limitation of our study is that only one database was searched, which may lead to the exclusion of relevant scientific literature.

CONCLUSION

In conclusion, a bibliometric review of publications on osteoarticular brucellosis from 1991 to 2022 demonstrates the growth of the research literature, with the importance of collaboration and significant contributions to countries with high brucellosis rates. Continuing research and funding are required to address the challenges of osteoarticular brucellosis and improve public health outcomes.

Authors' Contribution

Study Conception: CS; Study Design: CS; Supervision: CS; Funding: CS; Materials: CS; Data Collection and/or Processing: CS; Statistical Analysis and/or Data Interpretation: CS; Literature Review: CS; Manuscript Preparation: CS and Critical Review: CS.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

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