

Original Research Article

Dentistry-related COVID-19 documents published in scientific journals: A bibliometric analysis using Vosviewer

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Abstract

Background: Novel coronavirus disease 19 (COVID-19) is being spread by the severe acute respiratory syndrome coronavirus (SARS-CoV-2) and had a huge impact on millions of people globally. Numerous articles related to COVID-19 and its impact on dental practice have been published in different scientific journals in several languages.**Objective:** The aim is to conduct a descriptive bibliometric study of the main trends in dental research related to COVID-19, focusing on identifying the most productive journals, authors, institutions, and countries.**Materials and Methods:** The global literature about COVID-19 published between January 2020 and December 2022 was scanned using the Web of Science database. For the visualized study, bibliographic coupling analysis, co-authorship analysis, co-citation analysis, co-occurrence analysis and the analysis of publication trends were conducted by software tool, VOS viewer.**Results:** A total of 810 dentistry related to COVID-19 documents were identified, among which 480 (59.2%) were original articles, 137 (16.9%) review articles, 101 (12.5%) were editorials and 92 (11.4%) were letters to editors. The top three journals were the British Dental Journal, the International Journal of Environmental Research and Public Health, and the Journal of Dental Education, which accounted for 14.1% of all indexed literature. The USA (n=175, 21.6%) contributed the most to the research followed by Italy (n=114, 14.1%), the UK (n=92, 11.4%), China (n=74, 9.1%), and India (n=61, 7.5%).**Conclusion:** Using bibliometric analysis to identify scientific production is essential so that researchers can identify what has already been produced and is currently being researched thereby addressing knowledge gaps in the future.**Clinical Relevance:** A better understanding of existing research trends and potential research areas can be gained from this analysis. Such insights can help inform policy formulation, resource allocation, and evidence-based decision-making.**Keywords:** COVID-19, SARS-CoV-2, Coronavirus, Bibliometrics, Dentistry**Received:** 10-09-2024; **Accepted:** 14-10-2024; **Available Online:** 26-02-2025This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial 4.0 International](https://creativecommons.org/licenses/by-nc/4.0/), which allows others to remix, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.Contact: reprint@ipinnovative.com

1. Introduction

Novel coronavirus disease 19 (COVID-19) is being spread by the severe acute respiratory syndrome coronavirus (SARS-CoV-2) and is directly and indirectly harming millions of people globally.¹ COVID-19 has been well-recognized for its grave health, socioeconomic, and environmental consequences across all social strata, especially the elderly with comorbid diseases, homeless individuals, and others who have financial, mental and physical hardships.^{2,3} Amid this chaos, the scientific community has been active in publishing articles investigating various aspects of the disease, including epidemiological features, effective treatment

options, signs and symptoms, and how it has affected different operations and communities.^{4,5,6,7,8,9,10}

Dental journals are regarded as an important source of information on the dentistry-related implications of COVID-19 and SARS-CoV-2.^{2,7,9,11} Numerous articles related to COVID-19 and SARS-CoV-2 have been published in different scientific medical and dental journals, giving rise to a unique infodemic.^{12,13} Recent years have seen a substantial increase in dentistry-related COVID-19 Documents (DCDs), including articles, reviews, letters to editors, and preprints.^{6,7,12,14,15} Materials and Methods.

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2.1 Data collection

The articles studied in this analysis were extracted from the Web of Science (WOS) database (<https://clarivate.com/webofsciencegroup>), by Clarivate Analytics. In addition to the Core Collection publications, the WOS database includes articles from MEDLINE, BIOSIS Citation Index and previews, SciELO Citation Index, KCI Korean Journal Database, Russian Science Citation Index, and Current Contents Connect. There was no involvement of human subjects in this study, so institutional review board approval or informed consent was not needed.

The publications were searched using the following search keywords: (TS=COVID-19 OR 2019-nCoV OR coronavirus 2019 OR Coronavirus disease 2019 OR SARS-CoV-2) AND (SU=Dental OR dentistry OR oral health). The selection process did not include preprint databases like bioRxiv, arXiv, or medRxiv since such databases do not undergo the peer-review process, which may hamper their quality. To avoid bias caused by frequent database renewal, all the literature retrieval and data download were completed on March 1, 2023.

2.1 Inclusion and exclusion criteria

The inclusion criteria consisted of publications Web of science core collection, published in English, and published between 1st January 2020 and 31st December 2022. The following document types were excluded: duplicate publications, abstract, correction, clinical trial protocols, news patent, biography, conference papers, and unspecified or meeting, publications with no information on the author's name or affiliation or the article's digital object identifier.

2.2 Parameters studied

After a review of titles and abstracts, and ascertaining the accessibility of citation and cited references, the following parameters were extracted and analyzed: citation information – author(s), document title, year, source title, volume, issue, pages, citation count, source and document type, bibliographical information, affiliations, editor(s), keywords and funding details (number, acronym, sponsors). Based on the impact factor rankings from the 2019 Journal Citation Reports, all journals that were retrieved were divided into four groups, each belonging to a quartile: Q1, Q2, Q3, and Q4. The search strategy and the data collection process is explained in **Figure 1**.

2.3 Data analysis and Visualization

VOSviewer 1.6.11 (Leiden University, Leiden, Netherlands) is a software tool for the visualized analysis of the publications, which was used to extract the journals, authors, countries, and institutions/organizations of included studies and bibliographic coupling, co-authorship, co-citation, and co-occurrence analysis.^{16,17,18} Journal were ranked based on SCImago Journal & Country Rank which is a publicly available portal.¹⁹ The latest data on GDP (nominal) and

income classifications were collected from the World Bank database.²⁰

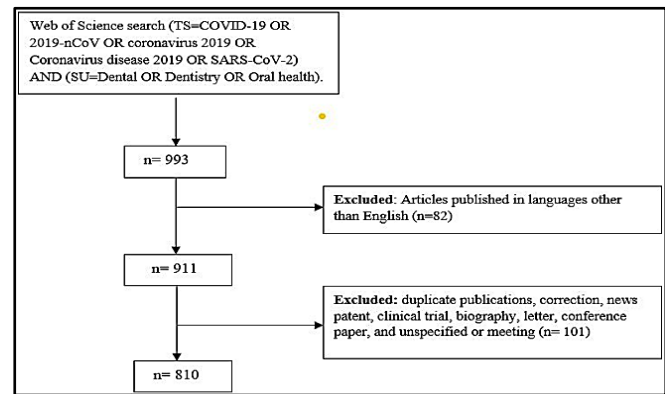


Figure 1:

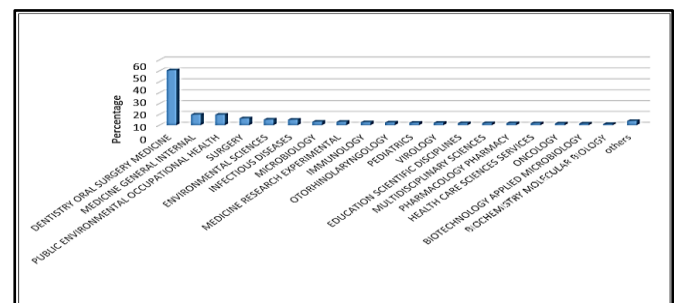


Figure 2:

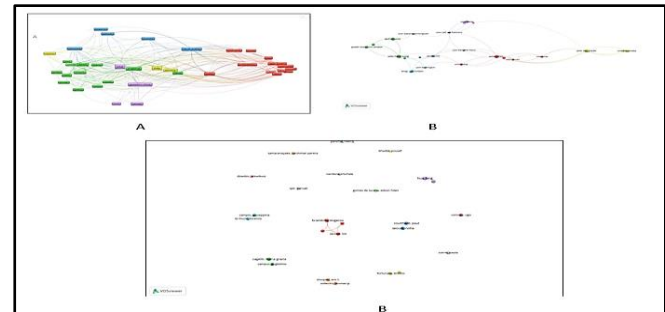


Figure 3: Bibliographic coupling analysis showing global research on COVID-19 and dentistry. (A) Mapping of the 41 countries who published 5 or more DCDs. (C) Mapping of 25 authors who published 4 or more documents.

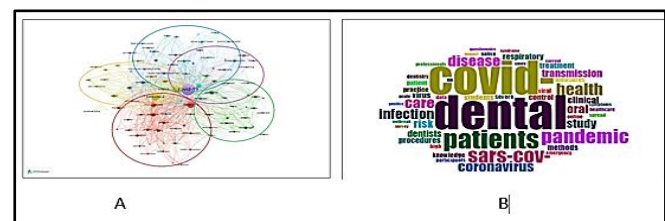


Figure 4: (A) Co-occurrence of keywords. Network visualization and analysis of keywords in the abstracts were performed, out of 1759 words 59 were selected and grouped into six clusters. (B) Word cloud. Tag clouds of words appearing in the abstracts of 810 DCDs. The font size represents the frequency of occurrence.

Table 1: The top 10 countries that published most DCDs

Rank	Country	Number of documents (%)	Number of citations	Average citations per document	Country's GDP (Nominal)*	Number of International collaborations	Total link strength
1	USA	175 (21.6)	2450	14	1	35	126
2	Italy	114 (14.1)	977	8.6	8	33	114
3	UK	92 (11.4)	537	5.8	5	35	123
4	China	74 (9.1)	2530	34.2	2	21	56
5	India	61 (7.5)	346	5.7	6	29	75
6	Saudi Arabia	56 (6.9)	286	5.1	19	27	83
7	Brazil	55 (6.8)	283	5.1	13	24	56
8	Canada	31 (3.8)	306	9.9	9	7	16
9	Germany	26 (3.2)	343	13.2	4	28	87
10	Pakistan	24 (2.9)	177	7.4	46	6	16

Table 2: The top 10 most active journals that published DCDs

Rank	Journal title	Publisher	WOS research category	Number of documents (%)	Number of citations	h- index 2019	Impact factor 2019	Quartile in category 2018	SJR 2019	Total link strength
1	British Dental Journal	Springer Nature, UK	Dentistry, Oral Surgery & Medicine	38 (4.69)	181	77	1.306	Q2	0.41	4855
2	International Journal of Environmental Research and Public Health	MDPI, Switzerland	Environmental Sciences; Public, Environmental & Occupational Health	38 (4.69)	501	92	2.849	Q2	0.74	14200
3	Journal of Dental Education	Wiley, USA	Dentistry, Oral Surgery & Medicine	35 (4.32)	143	66	1.322	Q2	0.44	3538
4	Oral Disease	Wiley, USA	Dentistry, Oral Surgery & Medicine	27 (3.33)	108	83	2.613	Q1	0.78	8440
5	Head and Neck	Wiley, USA	Otorhinolaryngology; Surgery	18 (2.22)	253	120	2.538	Q1	1.16	2266
6	British Journal of Oral & Maxillofacial Surgery	Churchill Livingstone, UK	Dentistry, Oral Surgery & Medicine	17 (2.10)	47	70	1.061	Q2	0.53	1174
7	Journal Of oral And Maxillofacial Surgery	WB Saunders Co-Elsevier Inc, USA	Dentistry, Oral Surgery & Medicine	13(1.60)	45	116	1.642	Q2	0.74	2195
8	BMC Oral Health	Springer Nature, UK	Dentistry, Oral Surgery & Medicine	12(1.48)	23	45	1.911	Q1	0.73	5149

9	Oral Oncology	Elsevier, Netherlands	Oncology;Dentistry, OralSurgery & Medicine	12 (1.48)	97	108	4.273	Q1	1.74	1586
10	European Journal of Dental Education	Wiley, USA	Dentistry, Oral Surgery & Medicine; Education, Scientific Disciplines	11 (1.36)	49	38	1.423	Q2	0.38	2513

Table 3: Top 10 most cited articles in the research domain of dentistry and COVID-19.

Sl. no	Journal name	Article	Authors	Impact factor (2019-2020)	Rank (of 91) in category (2022)	Quartile in category (2018)	Number of citations
1	International Journal of Oral Science	Transmission routes of 2019-nCoV and controls in dental practice	Peng et al.	3.047	12	Q1	491
2	Journal of Dental Research	Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine	Meng et al.	4.914	3	Q1	385
3	Journal of Endodontics	Coronavirus Disease 19 (COVID-19): Implications for Clinical Dental Care	Amber A et al.	3.118	11	Q1	143
4	Clinical Oral Investigations	Coronavirus COVID-19 impacts to dentistry and potential salivary diagnosis	Sabino-Silva et al.	2.812	15	Q1	127
5	British Dental Journal	Dentistry and coronavirus (COVID-19)-moral decision-making	Coulthard P	1.306	72	Q4	86
6	Journal of Dental Research	COVID-19 Transmission in Dental Practice: Brief Review of Preventive Measures in Italy	Izzetti et al.	4.914	3	Q1	76
7	Journal of Dental Research	The impact of the COVID-19 epidemic on the utilization of emergency dental services	Guo et al.	1.034	83	Q4	57
8	Journal of Dental Education	Impact of COVID-19 on dental education in the United States	Iyer et al.	1.322	71	Q4	53
9	International Journal of Oral Science	Saliva: potential diagnostic value and transmission of 2019-nCoV	Xu et al.	3.047	12	Q1	43
10	Saudi Dental Journal	Guidelines for dental care provision during the COVID-19 pandemic	Alharbi et al	1.500	NA	Q2	37

3.2 Journals publishing research

The top 10 journals have published 196 (24.4%) documents of all 810 DCDs (**Table 2**). Among them the top three journals were the *British Dental Journal*, the *International Journal of Environmental Research and Public Health*, and the *Journal of Dental Education*, which accounted for 14.1% of all indexed literature. DCDs

published in the *International Journal of Environmental Research and Public Health* (n=501) received the most citations, followed by the *Head and Neck* (n=253) and the *British Dental Journal* (n=181). The highest Impact Factor belongs to the *Oral Oncology* (4.273), followed by the *International Journal of Environmental Research and Public Health* (2.849) and the *Oral Diseases* (2.613). Based

on the SJR (2019), the highest-ranking journals were Oral Oncology (1.74), and Head & Neck (1.16).

3.2 Bibliographic coupling analysis

The top 5 countries based on a minimum number of publications of a country more than 5 were shown in figure 3 (A) and includes the USA (n=126 times), the UK (n=123 times), Italy (n=114 times), Germany (n=87 times) and Saudi Arabia (n=83 times). There were 53 institutions that produced 5 or more DCDs which is shown in figure 3 (B). The top 5 universities showed in terms of Total Link Strength (TLS) include *Hong Kong University* with 18 documents (TLS=19 times), the *University of Sao Paulo* with 18 documents (TLS=19 times), the *University of Milan* with 18 documents and (TLS=18 times), the *Queen Mary University London* 12 documents and 449 citations (TLS=18 times) and the *Mohammed Bin Rashid University of Medical and Health Science* 5 documents (TLS=18 times).

3.3 Co-authorship analysis

Among the 4051 researchers who contributed to 810 DCDs, 3696 researchers published one document, 288 researchers published two documents, 42 researchers published three documents, and 19 researchers published four documents. Paul Coulthard, Danchen Qin, Noha Seoudi, Eugenio Brambila, Fang Hua and Maria Cagetti are the researchers who have published five DCDs. When the network map was plotted with frequency greater than 4 documents, it had 25 researchers forming 16 clusters (**Figure 4 A**).

3.4 Quality of publication from different publications

Using the WOS database analysis, total citations, average citation, and h-index were calculated. The overall h-index was 37 and The average citations per document was 9.24. Among 810 DCDs, the sum of times cited was found to be 7501, among which 5615 were without self-citations. Out of 4387 articles that were cited through DCDs, 1168 were from the USA, 537 were from Italy, 525 were from China, 386 were from the UK, and 384 were from India.

3.5 Institutions

Among the institutions with the highest number of DCDs published, the *University of London* is top of the list with 33 documents, followed by the *University of Hong Kong*, the *University of Milan*, and the *University of Sao Paulo*, each with 18 documents (**Table 3**). However, the *University of Hong Kong* had received the greatest number of citations (n=741) citations for dentistry-related COVID-19 documents, followed by the *Wuhan University* and the *University of London* with 449 and 227 citations, respectively. The top 10 institutions affiliated with the retrieved DCDs are listed in **Table 3**.

3.5 Country

Each country in this network is illustrated with different colours, standing for the number of average citations per document that has been received by them. The highest average citations per document regardless of the number of publications and collaborations belonged to China (n=34.2), the USA (n=14), Germany (n=13.2) and Spain (n=12.4).

3.6 Analysis of themes and trend topics

Analysis of 810 DCDs yielded 1759 keywords that were analyzed by VOSviewer (**Figure 4 A**). With respect to different clusters, the following keywords occurred often: Cluster 1, COVID-19 (386 times), pandemic (45 times), dental education (41 times), and anxiety (29 times); Cluster 2, transmission (62 times), aerosols (47 times), and efficacy (29 times); Cluster 3, infection control (55 times), prevention (23 times), and virus (21 times); Cluster 4, infection (54 times), saliva (28 times), and outbreak (24 times); Cluster 5, dentist (26), knowledge (25 times) and awareness (12 times); Cluster 6, pneumonia (30 times), Wuhan (14 times), and China (12 times).

Red Cluster 2 [transmission (62 times), aerosols (47 times), and efficacy (29 times)] discussed the next topic of urgent discussion among the fraternity, which concerned how to prevent the spread of the virus in dental settings and the role of aerosol-generating procedures. The papers in Blue Cluster 3 [infection control (55 times), prevention (23 times), and virus (21 times)] discussed infection prevention guidelines and protocols from different agencies. It was followed by Yellow Cluster 4 [infection (54 times), saliva (28 times), and outbreak (24 times)] exploring the potential role saliva has in promoting infection transmission. Despite being less frequent than earlier clusters, this cluster was of particular importance because it examined a previously unexplored aspect of the disease.

In figure 4A, 59 keywords that appeared more than 10 times were included and were grouped into 6 clusters in the map, each cluster forming a theme/topic. Each cluster stands for a theme. Theme (green) is the about the impact of COVID-19 on dental education and the anxiety it is creating among dental students; Theme 2 red) is about the prevention of transmission of the virus in a dental setting and the role of aerosol generating procedures; Theme 3 (blue) is about the infection prevention guidelines and protocols from different agencies; Theme 4 (yellow) deals with role of saliva in COVID-19 outbreak; Theme 5 (purple) is about awareness and knowledge of dentists about COVID-19; Theme 6 (aqua) highlights the origin of COVID-19. Figure 4B shows tag clouds of words appearing in the abstracts of 810 DCDs, where font size stands for the frequency of occurrence. Among the words that occur most often in the abstract, dental, COVID-19, patients, pandemic, and infection appear the most often.

2. Discussion

Controlling the spread of COVID-19, establishing proper safety protocols for the institution, and managing the disease itself have been the most urgent tasks for medical and scientific communities.²¹ In many dental journals, topics such as salivary diagnostics, COVID-19 manifestations in the oral cavity and dental aerosol procedures and their considerations in COVID-19 transmission have been published.^{9, 12, 13, 19} However, our objective was to perform a comprehensive bibliometric analysis primarily on the research output of dental journals on COVID-19.

According to the dataset, 175 articles were published in the USA, accounting for over 21% of all research published worldwide, per earlier bibliometric analyses.^{15,17,19,21,22,22,23} Because this analysis only included journals published in English, this could explain the difference. This suggests that the research was conducted in a Western-centric academic setting and may not reflect the actual global distribution of research.

In the analysis of the highest number of citations per document, China topped the list, followed by the USA, Germany and Spain. It is possible that the high number of citations from China is a result of clinical research published from this region since this area was the first global hotspot and early investigations happened there. This information has been instrumental in developing effective prevention and treatment strategies for the virus in China and elsewhere.^{23,24}

A total of 341 international collaborations were recorded, with the strongest collaborations occurring in a cluster involving the USA, China, Canada, and Israel. There were 35 countries taking part in international collaborations, with the United States and United Kingdom collaborating with the most. In addition to enhancing our understanding of COVID-19's impact on dental practice, these collaborations have also contributed to developing effective prevention strategies.

There were 53 institutions that published at least five publications when co-authorship coupling, and analysis were conducted. The University of London had 33 documents, followed by Hong Kong University, Sao Paulo University, and Milan University, each with 18. With 297.8 deaths per 100,000 population, the UK has the highest rate of Coronavirus deaths in Western Europe.³ This is even though the country has one of the most advanced healthcare systems in the world and one of the best performing countries in the world.

The most citations were found at the University of Hong Kong and Wuhan University as the initial outbreak made these two cities among the first global hotspots for SARS-CoV2. This shows that these universities were at the forefront of the research and response to the pandemic in its preliminary stages. As a result of the undivided attention of research

groups to a single topic, these citations accumulated rapidly over a brief period.²⁵

The number of articles in the study was large enough to analyze the knowledge trend in dentistry and COVID-19, but there are also some limitations. Even though the analysis of English-language journals is significant since they are more compatible with international information exchange, many articles published in other languages were not included. It is now necessary to conduct more comprehensive bibliometric analyses of dental journals in all languages in the future.

3. Conclusion

A comprehensive analysis of COVID-19 research output and contributions is presented in this study. This data can also be used to benchmark progress in research and foster collaboration across international boundaries. It can also provide a platform for researchers to share their ideas and collaborate on projects. This study suggests that the increased international cooperation among researchers during the pandemic led to a better quality of evidence and research regarding COVID-19, which may have made it easier for dentists to implement prevention and control measures.

4. Source of Funding

None.

5. Conflict of Interest

None.

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