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Original article

Bibliometric analysis of COVID-19 related publications in Indian orthopaedic journals

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ABSTRACT

Background: The COVID-19 pandemic has resulted in an infodemic about the novel coronavirus SARS-CoV-2 outbreak to build knowledge and develop mitigation strategies. In addition, scientific journals across the world have studied the impact of COVID-19 on trauma and orthopaedics.

Methods: A cross-sectional, bibliometric analysis of the literature was undertaken on COVID-19 related articles from three Pubmed and Scopus indexed orthopaedic journals from India, namely, Indian Journal of Orthopaedics(IJO),Journal of Clinical Orthopaedics and Trauma(JCOT), and Journal of Orthopaedics (JOO), in May 2021. All the article types and study designs were included for this review. The authors, institutions, countries, keywords, and co-authorship mapping were studied.

Results: A total of 112 COVID-19 related documents were retrieved. Period of these publications was from 2nd April 2020 to 31st May 2021. Vaishya R. (n = 16) was the most cited author, and Indraprastha Apollo Hospitals (n = 16) was the most cited research Institution. India led the list of countries in academic publication output. On keyword mapping, telemedicine was the most prominent Medical Subject Headings (MeSH) search word.

Conclusion: The Indian orthopedic journals have addressed the impact of COVID-19 on orthopaedic practice in India and aborad whilst continuing to publish knowledge about basic science and clinical orthopaedic research studies. The JCOT has outperformed and become the most leading orthopaedic journal from India during the pandemic. COVID -19 articles have been fast tracked, open accessed and attracted more citations in reduced duration of time compared to non-COVID-19 papers.

1. Introduction

COVID-19 pandemic has gripped the whole world in a short period of time. The World Health Organisation (WHO), Centre for Disease Prevention and Control (CDC), and various national and international organisations, including the Ministry of Health and Family Welfare, Government of India (MOHFW), have published guidelines to prevent viral transmission and control the COVID-19 pandemic.[1] Scientists and the research community worldwide responded to understand the pathophysiology of COVID-19, and to develop management strategies, and recently effective vaccines to combat with the disease.[2–4] The research into various aspects of COVID-19 disease, prevention, challenges, consequences, solutions, and pitfalls people have encountered in their practices has been published extensively in the worldwide medical literature. It has led to a massive surge in the number of publications related to COVID-19and an 'infodemic' about the SARS-CoV-2 disease has thus resulted.[5–8] The impact of COVID-19 on different facets of trauma and orthopaedics speciality and services have been published widely. For example, challenges and strategies to manage urgent orthopaedic conditions, suspension of elective orthopaedic surgery, innovative ways to provide continuity of patient care, and orthopaedic training have been highlighted.[9–12] Bibliometric analysis of publications on the effect of COVID-19 in trauma and orthopaedics has observed that during the initial three months from the onset of pandemic, there was an unprecedented increase in the number of publications on COVID-19 worldwide.[13] We have

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aimed to analyse the trend of COVID-19 related articles from Pubmed and Scopus indexed orthopaedic journals from India, namely, Indian Journal of Orthopaedics (IJO), Journal of Clinical Orthopaedics and Trauma (JCOT), and Journal of Orthopaedics (JOO) in this cross-sectional bibliometric analysis.

2. Material and methods

2.1. Data source

Published papers and articles were searched via a topic search (title/article) of COVID-19 on the databases of PubMed and Scopus on 31st May 2021.

2.2. Eligibility criteria and study selection

Only articles with a focus on COVID-19 in the Pubmed and Scopus indexed orthopaedic journals from India, namely Indian Journal of Orthopaedics (IJO), Journal of Clinical Orthopaedics and Trauma (JCOT), and Journal of Orthopaedics (JOO), were included. Only the documents in the English language were considered for this study. Two authors (MP and VKJ) independently performed article selection and data extraction. Differences in opinion were settled by the most senior author, RV.

2.3. Search strategy

To retrieve all the COVID-19 related papers published in IJO, JCOT, and JOO from the Scopus, we have used the Scopus advanced search feature and the following search strategy: SRCTITLE (Indian Journal of Orthopaedics) AND COVID-19 for IJO, SRCTITLE (Journal of Clinical Orthopaedics and Trauma) AND COVID-19 for JCOT and SRCTITLE (Journal of Orthopaedics) AND COVID-19 for JOO. Also, a combined search was performed to extract all articles related to COVID-19, as published in these Indian orthopaedic journals using combined search, equivalent to: (SRCTITLE (Indian Journal of Orthopaedics) OR SRCTITLE (Journal of Clinical Orthopaedics and Trauma) OR SRCTITLE (Journal of Orthopaedics) AND COVID-19 in May 2021. The search strategy has been described in Table 1.

2.4. Statistical analysis

Data regarding the top authors, institutions, and countries from which the COVID- 19 related papers were published in individual journals were extracted from the Scopus database, and relevant graphics were generated using Microsoft Excel for Mac (2016). Articles citing these papers from Indian journals were also analysed for each journal separately, especially journals and countries citing COVID-19 papers from each of these Indian orthopaedic Journals. The bibliographic data was imported in VOSviewer (Leiden University, Sweden) for Mac version 1.6.16 for generating keyword and co-authorship maps. The same was done for articles citing COVID-19 papers from Indian orthopaedic journals.

We also performed a correlation analysis (Karl Pearson correlation coefficient) between no of citations, Altmetric score, and level of evidence (LOE). If the coefficient value lay between ±0.50 and ±1, then it was considered strong correlation, moderate if it lay between ±0.30 and ±0.49, low if the value lay below +0.29, and $P < 0.05$ was considered significant.

Patient and public involvement: No patients were involved in this study.

Statement of Ethics: The current submitted article is not a clinical study involving any human subjects, and ethical approval was not applicable.

Table 1
Search strategy.

#1	SRCTITLE (Indian Journal of Orthopaedics) AND COVID 19
#2	SRCTITLE (Journal of Clinical Orthopaedics and Trauma) AND COVID 19
#3	SRCTITLE (Journal of Orthopaedics) AND COVID 19
#4	#1 OR #2 OR #3

3. Results

Articles and citations: A total of 112 COVID-19 related documents were published in the these three Indian orthopaedic journals, as revealed by the Scopus search and had received 349 citations till the submission of this study.These 112 articles were published between 1st March 2020 to 31st May 2021. On individual search, there were 56 COVID-19 papers in the JCOT, with 219 citations (average 3.91 citations per paper), 31 papers were in the IJO with 60 citations (average 1.93 citations per paper) and 25 papers were in JOO with 70 citations (average 2.8 citations per paper). There was moderate (+0.424, 95%CI: 0.075−0.680, $p = 0.02$) but a statistically significant positive correlation between Altmetric score and LOE.

***Top cited papers and h index*:** The top cited COVID-19 papers are depicted in Table 2, along with citations received in 2020 and 2021. *h*-index was defined as the top n papers in the set which had received at least n citations, and these papers can be considered to constitute the *h* core for COVID-19 papers in Indian orthopaedic journals. This figure was 12 overall, with ten papers from JCOT and one each from IJO and JOO. Therefore, the *h*-index was overall, and accordingly, papers are mentioned in Table 2. Top cited papers (at least 10) in individual journals are depicted in Table 3 (JCOT, *h* − index 11), (IJO, *h* − index 5), (JOO, *h* − index 5) respectively.

Top Authors, Institutions, and Countries: Overall the top three most published authors were Vaishya R (n = 16), Bagaria V (n = 8), and Vaish A (n = 8), respectively (Fig. 1A). The top three institutions from which COVID-19 research was published in Indian orthopaedic journals were Indraprastha Apollo Hospitals, New Delhi (n = 16), PGIMER, Chandigarh (n = 10), and Southport & Ormskirk Hospital - NHS Trust, UK (n = 6) (Fig. 1B). The top three publishing countries were India (n = 59), UK (n = 28), and USA (n = 9), respectively (Fig. 1C). The JOO differed in having more papers by foreign authors.

Citations received by COVID-19 Articles: Top journals citing COVID-19 papers from Indian orthopaedic journals are depicted in Fig. 2A (these include- International Orthopaedics, Injury, Postgraduate Medical Journal (PMJ), and Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA)), and the top countries (including UK, USA, Italy, Indonesia, and Spain) in Fig. 2B.

Keywords mapping: Keywords map of all COVID-19 papers (with a threshold value 1) as generated on VOSviewer is depicted in Fig. 3A. Telemedicine, rapid response team, orthopaedic surgeon, trauma, and aged were the prominent keywords. Keyword map for journals citing these papers is shown in Fig. 3B, which shows COVID-19, SARS-CoV-2, beta coronavirus, adult, orthopaedic surgery, and review as prominent keywords.

Co-authorship mapping: Co-authorship map of all journals is depicted in Fig. 4 (all journals). Prominent author groupings are with senior authors- Vaishya R et al., Bagaria V et al., Dhillon MS et al. and Malhotra R et al. (in IJO), and Mangwani J et al. Similar analysis for individual journals may be seen in the supplementary files(S1−S7).

4. Discussion

Publication output-: In India, publications related to COVID-19

in the three orthopaedic journals started in April 2020, almost a month after the first COVID-19 case in India in March 2020. The focus of the articles was to provide knowledge, challenges, and valuable experience during and after the COVID-19 pandemic. At the beginning of the pandemic, while limited information was available on COVID-19; majority of the papers were opinion pieces, editorials, guidelines, and commentaries. The first paper published in JCOT was in early April 2020 and was a rapid review and recommendations for Musculoskeltal and allied heath personnel.[14] Thereafter, numerous articles were published. Publications in the IJO started in mid-April 2020. Predominantly these were editorials and recommendations to deal with COVID-19, and orthopaedic management of patients as a consequence of the disease.[15] In contrast to the above two journals, the original articles based on patients' outcomes were published earlier in the JOO.

As the pandemic grew and surgeons started collecting data on the impact of COVID-19, increasing original studies and meta-analyses were published during the later stages of the pandemic. The JCOT has published six higher level of evidence papers, such as systematic reviews and meta-analyses, while the JOO has published one. There were no systematic review or meta-analysis published in the IJO. It was observed that no Randomised Control Trials (RCT) were published in any of the three orthopaedic journals. Of the original articles, the majority were retrospective cohort studies, electronic surveys and reviews in all three journals. Similarly, a study showed a parallel publication trend assessed in 20 orthopaedic journals.[16]

Citation is an important measure assessing the impact and quality of an published article. During the pandemic, COVID-19 related articles were published on fast-track process and have had the benefits of open access (OA) publication model. OA allowed universal, free reading and downloading of articles. It led to the timely dissemination of relevant knowledge about COVID-19 and its impact on orthopaedics at national and international levels. This also increased the visibility of publications to the readers and enhanced the ciatation counts. COVID-19 related articles in these three orthopaedic journals from India were OA on the journal website and PubMed search engine. The 'interval time' from acceptance to the time of publication in these journals was reduced substantially as compared to the pre COVID-19 period. In the JCOT, the meantime to acceptance and average time of publication of an article was much less as compared to IJO and JOO.This could be one of the possible explanations for the increased citations of articles published in JCOT (219) in comparison to the other two journals put together (130). The JCOT received several articles during the COVID-19 and their subsequent publications attracted numerous citations. Consequently, the Cite Score of the JCOT improved significantly.

h-index is one of the widely used independent, research metrics to evaluate the scholarly impact of an author. *h*-index was introduced by J.E. Hirsch (2005) to measure both the quantity and quality of the scientific performance of a researcher through publications.[17,18] A high *h*-index means the author has a relatively high number of highly cited papers. It is reflected in the *h*-index ofthe top three most published authors: Vaishya R (n = 16/*h*-index = 23), Bagaria V (n = 8/*h*-index = 12), and Vaish A (n = 8/*h*-index = 13) on the Scopus Author profile. However, individual *h*-index also adds up to the *h* Core index, a journal-level metric. The total number of publications in JCOT were equal to IJO, and JOO put together, with a

Table 2
Top 12 COVID- 19 papers from all 3 Indian orthopaedic journals.

S no	Publication Year	Document Title	*Altmetrics*	Level of evidence	Authors	Journal Title	Volume	2020	2021	Total
1	2020	Unprecedented surge in publications related to COVID-19 in the first three months of pandemic: A bibliometric analytic report	2	4	Kambhampati S.B.S., Vaishya R., Vaish A.	Journal of Clinical Orthopaedics and Trauma	11	12	15	27
2	2020	Internet of Medical Things (IoMT) for orthopaedic in COVID-19 pandemic: Roles, challenges, and applications	2	5	Pratap Singh R., Javaid M., Haleem A., Vaishya R., Ali S.	Journal of Clinical Orthopaedics and Trauma	11	15	10	25
3	2020	Post COVID-19: Planning strategies to resume orthopaedic surgery –challenges and considerations	9	5	Iyengar K.P., Jain V.K., Vaish A., Vaishya R., Maini L., Lal H.	Journal of Clinical Orthopaedics and Trauma	11	14	9	23
4	2020	Working through the COVID-19 outbreak: Rapid review and recommendations for MSK and allied heath personnel	4	5	Viswanath A., Monga P.	Journal of Clinical Orthopaedics and Trauma	11	15	8	23
5	2020	Impact of COVID 19 lockdown on orthopaedic surgeons in India: A survey	5	4	Sahu D., Agrawal T., Rathod V., Bagaria V.	Journal of Clinical Orthopaedics and Trauma	11	6	11	17
6	2020	Minimising aerosol generation during orthopaedic surgical procedures- Current practice to protect theatre staff during Covid-19 pandemic	1	5	Raghavan R., Middleton P.R., Mehdi A.	Journal of Clinical Orthopaedics and Trauma	11	8	8	16
7	2020	Early outcomes after hip fracture surgery in COVID-19 patients in New York City	0	4	Cheung Z.B., Forsh D.A.	Journal of Orthopaedics	21	5	10	15
8	2020	Annotation: The COVID-19 pandemic and clinical orthopaedic and trauma surgery	1	5	Ashford R.U., Nichols J.S., Mangwani J.	Journal of Clinical Orthopaedics and Trauma	11	13	2	15
9	2020	Revisiting conservative orthopaedic management of fractures during COVID-19 pandemic	10	5	Iyengar K., Vaish A., Vaishya R.	Journal of Clinical Orthopaedics and Trauma	11	8	6	14
10	2020	Carpal Fracture and COVID-19 Infection: Observation from Thailand	0	4	Joob B., Wiwanitkit V.	Indian Journal of Orthopaedics	54	13	1	14
11	2020	Fracture management during COVID-19 pandemic: A systematic review	11	4	Kumar Jain V., Lal H., Kumar Patralekh M., Vaishya R.	Journal of Clinical Orthopaedics and Trauma	11	1	12	13
12	2020	Effects of COVID-19 pandemic in the field of orthopaedics	5	5	Haleem A., Javaid M., Vaishya R., Vaish A.	Journal of Clinical Orthopaedics and Trauma	11	11	2	13

h-index = 12 (Of the 112 documents considered for the h-index, 12 have been cited at least 12 times.

Table 3
Comparison of COVID-19 related articles in Indian orthopaedics journals.

Journal(COVID 19 Data)	IJO				JOO				JCOT			
Publications	31				25				56			
Citations	60				70				219			
Authors	Dhillon, M.S.			6	Graichen, H.			3	Vaishya, R.			12
	Bagaria, V.			3	Bhat, A.K.			2	Vaish, A.			6
	Vaishya, R.			3	Cheung, Z.B.			2	Jain, V.K.			4
+	Aggarwal, S.			2	Forsh, D.A.			2	Bagaria, V.			3
	Aroojis, A.			2	Ahmad, C.S.			1	Iyengar, K.P.			3
	Arora, R.S.			2	Bagaria, V.			1	Kumar, A.			3
	Chhabra, H.S.			2	Banffy, M.B.			1	Lal, H.			3
	Goni, V.			2	Barbera, J.P.			1	Lim, M.A.			3
	Gopinathan, N.R.			2	Beckles, V.			1	Maini, L.			3
	Gulia, A.			2								
Institutions	Postgraduate Institute of Medical Education & Research, Chandigarh			9	Orthopaedic Hospital Lindenlohe			3	Indraprastha Apollo Hospitals			12
	All India Institute of Medical Sciences, New Delhi			3	Icahn School of Medicine at Mount Sinai			2	VMMC & Safdarjang Hospital			4
	Indraprastha Apollo Hospitals			3	Kasturba Medical College, Manipal			2	Southport and Ormskirk Hospital NHS Trust			4
	Sir HN Reliance Foundation Hospital and Research Center			2	Manipal Academy of Higher Education			2	Dr. Ram Manohar Lohia Hospital			3
									Maulana Azad Medical College			3
									University Hospitals of Leicester NHS Trust			3
									Universitas Pelita Harapan			3
	India			25	United States			8	India			26
	Italy			2	India			6	United Kingdom			22
	United Kingdom			2	United Kingdom			4	Indonesia			3
	Canada			1	Germany			3	Italy			2
	China			1	Italy			2	United States			2
	Singapore			1	Egypt			1	Egypt			1
									Singapore			1
Top 10 Papers related to COVID 19	Document Title	Total Citations	Altmetric	LOE	Document Title	Total citations	Altmetric	LOE	Document Title	Total citations	Altmetric	LOE
	Carpal Fracture and COVID-19 Infection: Observation from Thailand	14	0	4	Early outcomes after hip fracture surgery in COVID-19 patients in New York City	16	0	4	Unprecedented surge in publications related to COVID-19 in the first three months of pandemic: A bibliometric analytic report	27	2	4
	Significant Applications of Big Data in COVID-19 Pandemic	12	7	5	Management of hip fractures during the COVID-19 pandemic at a high-volume hip fracture unit in the United Kingdom	13	0	4	Internet of Medical Things (IoMT) for orthopaedic in COVID-19 pandemic: Roles, challenges, and applications	24	2	5
	COVID-19: Current Knowledge and Best Practices for Orthopaedic Surgeons	10	2	5	Challenges and strategies in management of osteoporosis and fragility fracture care during COVID-19 pandemic	10	10	5	Post COVID-19: Planning strategies to resume orthopaedic surgery −challenges and considerations	23	9	5
	Impact of COVID-19 Pandemic on Orthopaedic Trauma Volumes: a Multi-Centre Perspective From the State of Telangana	7	0	4	Spinal surgery in COVID-19 pandemic era: One trauma hub center experience in central-southern Italy	6	0	4	Working through the COVID-19 outbreak: Rapid review and recommendations for MSK and allied heath personnel	23	4	5
	Changing Pattern of Orthopaedic Trauma Admissions During COVID-19 Pandemic: Experience at a Tertiary Trauma Centre in India	5	0	3	It is time for a more cautious approach to surgical diathermy, especially in COVID-19 outbreak: A schematic review	5	0	4	Impact of COVID 19 lockdown on orthopaedic surgeons in India: A survey	17	5	4
	Peri-operative Outcomes and Predictors of Mortality in COVID-19 Positive Patients with Hip Fractures: A	3	0	4	Emergency and Urgent Orthopaedic Surgeries in non-covid patients during the COVID 19 pandemic: Perspective from India	5	0	4	Minimising aerosol generation during orthopaedic surgical procedures- Current practice to protect theatre	16	1	5

Table 3 (*continued*)

Journal(COVID 19 Data)	IJO				JOO				JCOT			
	Multicentre Study in the UK								staff during Covid-19 pandemic			
	How Much has COVID-19 Pandemic Affected Indian Orthopaedic Practice? Results of an Online Survey	3	0	4	Change in practice due to COVID-19 – Early experiences of a United Kingdom district general hospital in trauma &; orthopaedics	4	0	4	Annotation: The COVID-19 pandemic and clinical orthopaedic and trauma surgery	15	1	5
	Management of Orthopaedic Patients During COVID-19 Pandemic in India: A Guide	3	0	5	Orthopaedic patient workflow in CoViD-19 pandemic in Italy	4	3	5	Fracture management during COVID-19 pandemic: A systematic review	13	10	5
	Is Immuno-modulation the Key to COVID-19 Pandemic?(*Non Orthopaedic Paper*)	3	31	5	Orthopaedic Walk-In Clinics: A model to lessen the burden on Emergency Departments during the COVID-19 pandemic	4	0	5	Revisiting conservative orthopaedic management of fractures during COVID-19 pandemic	13	10	5
	Roles and Responsibilities of the Orthopaedic Community and the Society During COVID-19 Pandemic	3	0	5	Design, usage and review of a cost effective and innovative face shield in a tertiary care teaching hospital during COVID-19 pandemic	3	0	4	Effects of COVID-19 pandemic in the field of orthopaedics	13	5	5

significantly greater number of citations. This has been reflected in the rise of *h* Core index of JCOT.

During COVID-19, articles were published from all over the world in these three journals regarding its impact on orthopaedic practices. Majority of articles published in the IJO and JCOT were from India. R Vaishya was the top author from Indraprastha Apollo Hospitals, who has published 16 articles together in IJO and JCOT.

In the JCOT, most papers were predominantly from India and the United Kingdom (UK), signifying good collaboration amongst authors from these regions amidst the COVID-19 pandemic. On the other hand, in IJO, greatest number of articles were from India itself and a few were from the other areas of the world (Italy, UK, Canada etc.). JOO had the highest number of articles from the United States, followed closely by those from India, and UK and a few from other

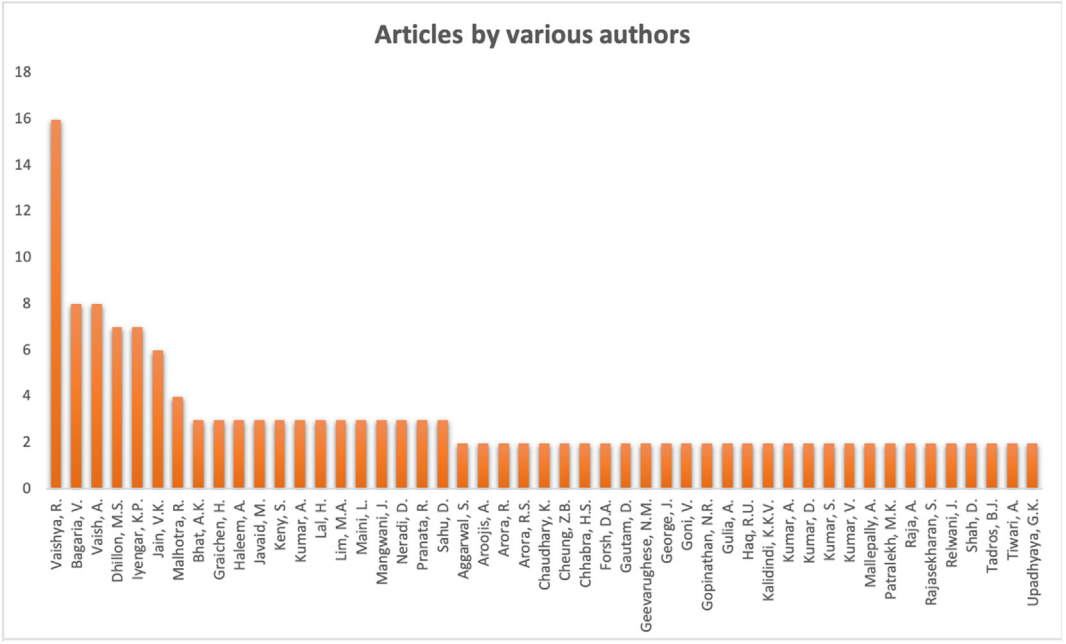

Fig. 1. Showed the total number of article by various authors (A); from various institutions (B); in all indian orthopedic journals from various countries (C) during the study period.

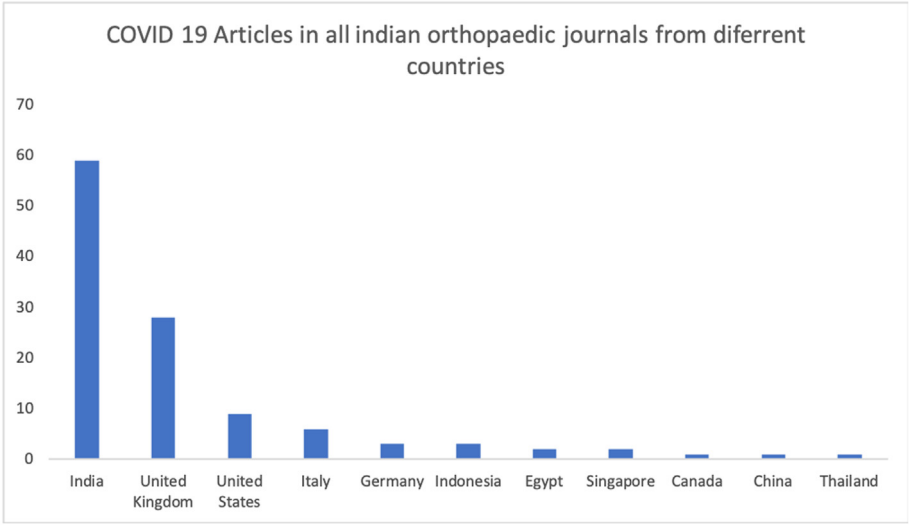

Fig. 1. (*continued*).

countries. This may indicate a preference by the particular journal for articles originating in the US and UK (outside India) while maintaining a space for papers from India amidst the ongoing pandemic.

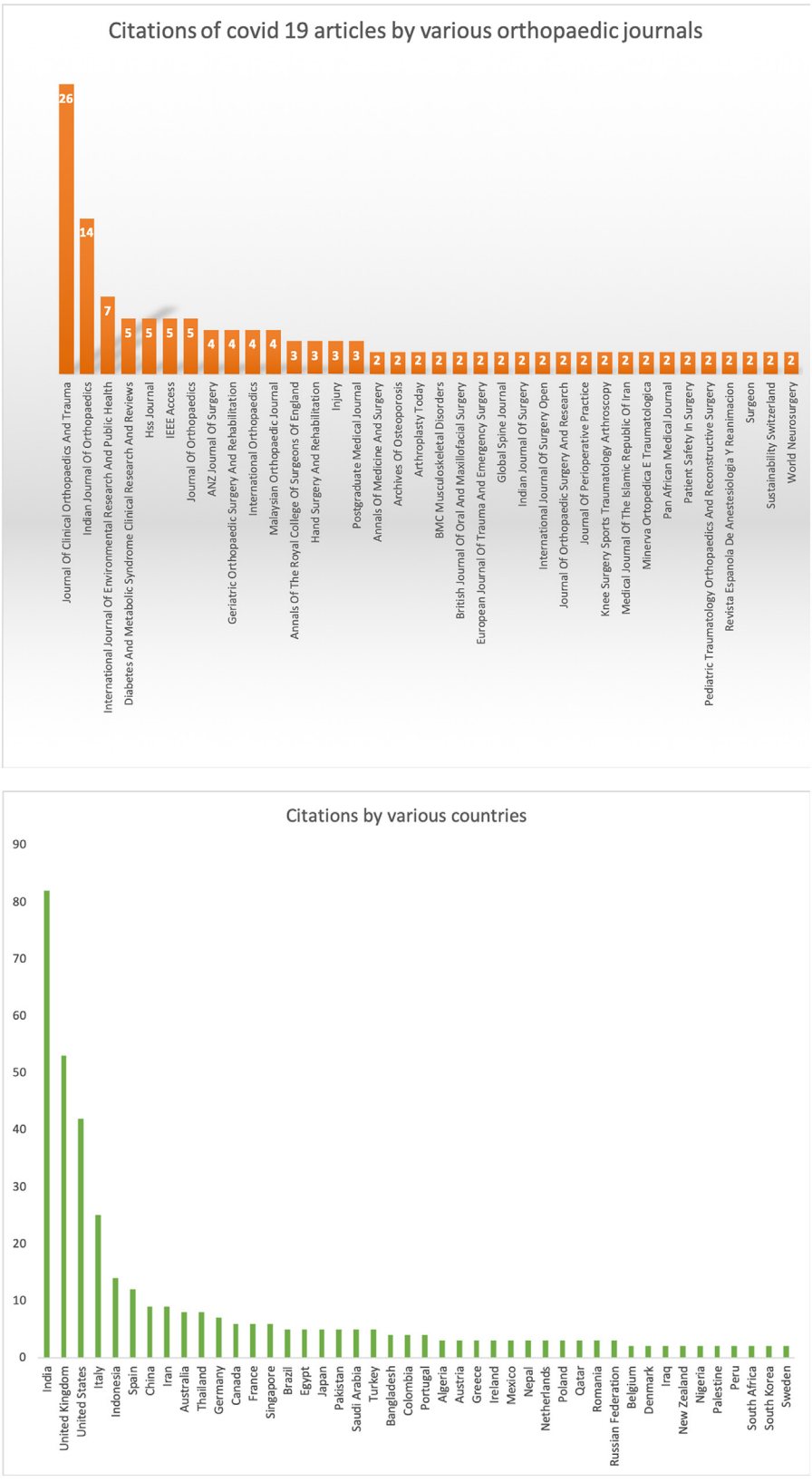

Fig. 2. Showed citation of COVID-19 articles by various orthopedic journals (A); citations by various countries (B).

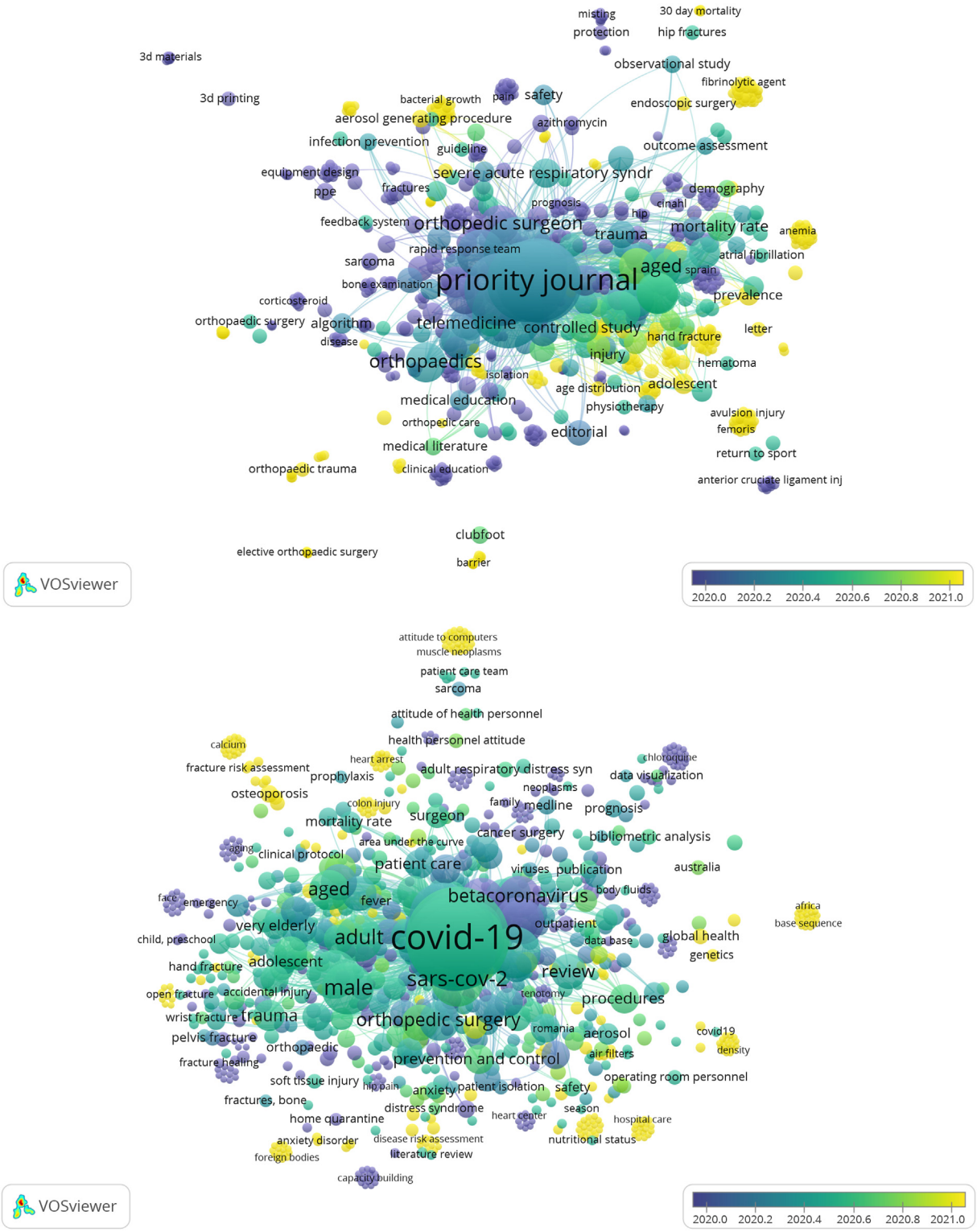

Fig. 3. COVID-19 keywords network all indian orthopaedic journals (A); COVID 19 Keywords network for citing papers all Indian orthopaedics journals (B).

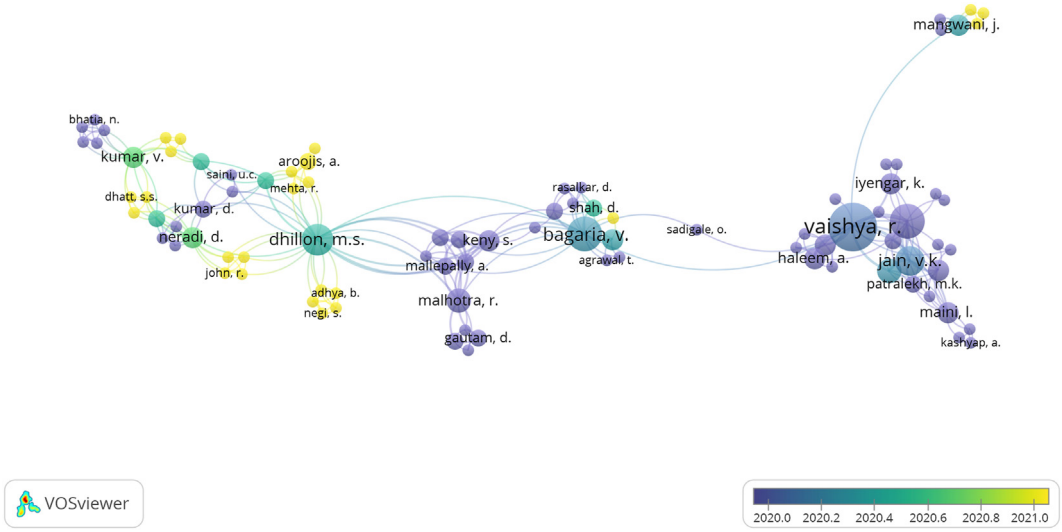

Fig. 4. COVID-19 authorship network from all indian orthopaedic journals.

COVID-19, SARS-CoV-2, beta coronavirus, adult, orthopaedic surgery, telemedicine, and review were the prominent keywords in the COVID-19 related articles submitted to the three journals. This is not surprising with the article topics revolving around the impact of COVID-19 on trauma and orthopaedics. However, 'telemedicine' has evolved as a keyword not only in these journals but across the range of academic articles published worldwide. The novel coronavirus SARS- CoV-2 outbreak has necessitated the reduction of 'face-to-face interactions' in all elements of life, including the provision of healthcare. 'Telemedicine' development and applications have been fast-tracked during the pandemic, with significant applications in the delivery of patient care using remote consultations and virtual clinical assessments.[12] and [19,20] Telemedicine users have also influenced the field of trauma and orthopaedics, its evolving role in the management of musculoskeletal conditions during COVID-19 thus, have been highlighted increasingly in articles submitted to these journals. InVOS viewer, a minimum threshold was used for mapping networks and therefore, not all items could be highlighted.

Co-authorship mapping[21] has been included in bibliometric analysis because of its descriptive and synthetic power to describe the evolution of research.[22] This mapping indicates groups of authors involved in COVID-19 related manuscript working amidst the pandemic and their linkages. There appears to be a link between co-authorship and scientific impact – citation of published articles.[23,24] Experience, author degree, and seniority in a particular field of medicine have both cognitive and reputation advantages to influence the paper's impact.[25,26] This is evident from the main author groupings with senior authors in this study.

The VOSviewer, is a devoted software tool for constructing and visualizing bibliometric networks.[27–29] In this study, it was used for the analysis of the networking amongst the authors and also to generate the knowledge maps of keywords, which in turn indicates prominent areas of orthopaedic research related to the COVID- 19 pandemic, as published in Indian Journals.

4.1. Limitations of the study

We have analysed the trend of COVID-19 related articles during the last two years pertaining only to the PubMed and Scopus indexed Indian orthopaedic journals and not from the whole spectrum of orthopaedic journal output from the subcontinent. However, these represent the impactful journalistic content from India and their popularity amongst the readerships. Therefore, it may be interesting to assess these parameters compared with similar leading journals across the world.

5. Conclusion

This bibliometric analysis has highlighted the trend of COVID-19 related articles published in the three PubMed, and Scopus indexed orthopaedic journals from India. Like the other global journals, these journals from India have drawn attention to the impact of COVID-19 on orthopaedic practice while continuing to publish knowledge about basic science and clinical research studies about all aspects of musculoskeletal disorders. However, out of the three, JCOT in this journey has raced ahead to become the most leading orthopaedic journal from India, with the most increasing *h*-index and Cite score. It is reflected in the journalistic output, which reveals the total number of COVID publications in JCOT were equal to IJO and JOO put together, with a significantly greater number of citations. COVID -19 articles attracted more citations in lesser duration of time compared to non-COVID-19 papers. This growing trend bodes well to India's premier orthopaedic journals and reflects their growing popularity worldwide among researchers and readers.

Author statements

Author's Contributions: VKJ,MKP,KPI involved in Conceptualization, literature search, manuscript writing and editing. VKJ,MKP, KPI in literature search, methodology, data curation, manuscript review, and editing. RV supervised overall submission and approved the final draft. All authors read and agreed the final draft submitted.

Funding statement

The authors have not declared a specific grant for this research from any funding agency in public, commercial or not-for-profit sectors.

Statement of Ethics

The current submitted article is not a clinical study and does not involve any patients.

Declaration of competing interest

All the authors are on the Editorial board of the JCOT and Author #1,2 are also on the Editorial board of the IJO.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcot.2021.101608.

References

1. Centre for Disease Prevention and Control (CDC). COVID-19. Available at: https://www.cdc.gov/coronavirus/2019-ncov/index.html . Accessed July 5, 2021. Accessed.
2. Majumder J, Minko T. Recent developments on therapeutic and diagnostic approaches for COVID-19. *AAPS J*. 2021 Jan 5;23(1):14. https://doi.org/10.1208/s12248-020-00532-2.
3. Javaid M, Haleem A, Vaishya R, Bahl S, Suman R, Vaish A. Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. *Diabetes Metab Syndr*. 2020 Jul-Aug;14(4):419–422. https://doi.org/10.1016/j.dsx.2020.04.032. Epub2020Apr 24.
4. Centre for Disease Prevention and Control (CDC). Vaccines for COVID-19. Available at:https://www.cdc.gov/coronavirus/2019-ncov/vaccines/index.html . Accessed July 5, 2021. Accessed.
5. Kambhampati SBS, Vaishya R, Vaish A. Unprecedented surge in publications related to COVID-19 in the first three months of pandemic: a bibliometric analytic report. May;11 *J Clin Orthop Trauma*. 2020;(Suppl 3):S304–S306. https://doi.org/10.1016/j.jcot.2020.04.030. Epub 2020 May 13.
6. ElHawary H, Salimi A, Diab N, Smith L. Bibliometric analysis of early COVID-19 research: the top 50 cited papers. *Inf Disp*. 2020 Oct 13;13, 1178633720962935. https://doi.org/10.1177/1178633720962935.
7. Yu Y, Li Y, Zhang Z, et al. A bibliometric analysis using VOSviewer of publications on COVID-19. *Ann Transl Med*. 2020 Jul;8(13):816. https://doi.org/10.21037/atm-20-4235.
8. Chahrour M, Assi S, Bejjani M, et al. A bibliometric analysis of COVID-19 research activity: a call for increased output. *Cureus*. 2020 Mar 21;12(3), e7357. https://doi.org/10.7759/cureus.7357.
9. Vaishya R, Vaish A, Kumar A. Impact of COVID-19 on the practice of orthopaedics and trauma-an epidemiological study of the full pandemic year of a tertiary care centre of New Delhi. *Int Orthop*. 2021 Jun;45(6):1391–1397. https://doi.org/10.1007/s00264-021-05021-5. Epub 2021 Apr 9.
10. Upadhyaya GK, Jain VK, Iyengar KP, Patralekh MK, Vaish A. Impact of COVID-19 on post-graduate orthopaedic training in Delhi-NCR. *J Clin Orthop Trauma*. 2020 Oct;11(Suppl 5):S687–S695. https://doi.org/10.1016/j.jcot.2020.07.018. Epub 2020 Jul 25.
11. Jain VK, Vaishya R. COVID-19 and orthopaedic surgeons: the Indian scenario. *Trop Doct*. 2020 Apr;50(2):108–110. https://doi.org/10.1177/0049475520921616. Epub 2020 Apr 21.
12. Iyengar K, Vaish A, Toh E, Vaishya R. COVID-19 and remote consulting strategies in managing trauma and orthopaedics. *Postgrad Med*. 2020 Jul;96(1137):438–439. https://doi.org/10.1136/postgradmedj-2020-137917. Epub 2020 May 13. PMID: 32404496.
13. Kambhampati SB, Vaishya R, Paleti ST, Khanduja V. Making sense of the infodemic – a bibliometric analysis of publications on COVID-19 in trauma and orthopaedics. *Indian J Med Sci*. 2020;72(3):155–166.
14. Viswanath A, Monga P. Working through the COVID-19 outbreak: rapid review and recommendations for MSK and allied heath personnel. *J Clin Orthop Trauma*. 2020 May-Jun;11(3):500–503.
15. Vaishya R, Vaish A. Roles and responsibilities of the orthopaedic community and the society during COVID-19 pandemic. *Indian J Orthop*. 2020 Apr 14;54(3):398–399.
16. Liu IZ, Wang KY, Robin JX, McGeary I, Hemal K, Boyd CJ. Chronicling the effect of COVID-19 on orthopedic literature. *J Orthop*. 2021 Jul-Aug;26:107–110.
17. Hirsch JE. An index to quantify an individual's scientific research output. *Proc Natl Acad Sci U S A*. 2005 Nov 15;102(46):16569–16572.
18. Bastian S, Ippolito JA, Lopez SA, Eloy JA, Beebe KS. The use of the h-index in academic orthopaedic surgery. *J Bone Joint Surg Am*. 2017 Feb 15;99(4):e14.
19. Upadhyaya GK, Iyengar K, Jain VK, Vaishya R. Challenges and strategies in management of osteoporosis and fragility fracture care during COVID-19 pandemic. *J Orthop*. 2020 Jun 2;21:287–290.
20. Lal H, Sharma DK, Patralekh MK, Jain VK, Maini L. Outpatient Department practices in orthopaedics amidst COVID-19: the evolving model. *J Clin Orthop Trauma*. 2020 Jul-Aug;11(4):700–712.
21. Sachini E, Sioumalas-Christodoulou K, Chrysomallidis C, Siganos G, Bouras N, Karampekios N. COVID-19 enabled co-authoring networks: a country-case analysis. *Scientometrics*. 2021 Mar 26:1–20.
22. Biscaro C, Giupponi C. Co-authorship and bibliographic coupling network effects on citations. *PloS One*. 2014 Jun 9;9(6), e99502.
23. Wallace ML, Larivière V, Gingras Y. A small world of citations? The influence of collaboration networks on citation practices. *PloS One*. 2012;7(3), e33339.
24. Vaishya R, Patralekh M, Vaish A, Agarwal AK, Vijay V. The top 10 most cited Indian articles in arthroscopy in last 10 years. *Indian J Orthop*. 2017 Sep-Oct;51(5):505–515.
25. Uddin S, Hossain L, Rasmussen K. Network effects on scientific collaborations. *PloS One*. 2013;8(2), e57546.
26. Long JC, Cunningham FC, Carswell P, Braithwaite J. Patterns of collaboration in complex networks: the example of a translational research network. *BMC Health Serv Res*. 2014 May 20;14:225.
27. Yu Y, Li Y, Zhang Z, et al. A bibliometric analysis using VOSviewer of publications on COVID-19. *Ann Transl Med*. 2020 Jul;8(13):816. https://doi.org/10.21037/atm-20-4235.
28. Vaishya R, Patralekh MK, Vaish A. The upsurge in research and publication on articular cartilage repair in the last 10 years. *Indian J Orthop*. 2019 Sep-Oct;53(5):586–594. https://doi.org/10.4103/ortho.IJOrtho_83_19. PMID: 31488924.
29. Vaishya R, Patralekh MK, Vaish A, Agarwal AK, Vijay V. Publication trends and knowledge mapping in 3D printing in orthopaedics. *Journal of clinical orthopaedics and trauma*. 2018 Jul 1;9(3):194–201.