



Research Publication Performance of Medical Literature on COVID-19 Pandemic in India (2019-2021): a Scientometrics Analysis

Sk Abdul Gaffar, Md Saddam Hossainn, S. Kishore Kumar and M Sadik Batcha

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

July 13, 2021

Research Publication Performance of Medical Literature on COVID-19 Pandemic in India (2019-2021): A Scientometrics Analysis

¹Sk Abdul Gaffar ORCID-0000-0003-0500-8119

¹Research Scholar (Ph.D.), Department of Library and Information Science, Alagappa University, Karaikudi, Tamil Nadu, India, Email- gaffaramu@gmail.com

²Md Saddam Hossain ORCID 0000-0001-5397-5280

²Research Scholar (Ph.D.), Department of Library and Information Science, Annamalai University, Karaikudi, Tamil Nadu, India, Email- saddamhossain654@gmail.com

³Dr. S. Kishore Kumar ORCID - 0000-0001-7694-4807

³Deputy Librarian, Central Library, Department of Library and Information Science, Alagappa University, Tamil Nadu, Email- libkishore@yahoo.com

⁴Dr. M Sadik Batcha ORCID - 0000-0002-8533-1073

⁴University Librarian, Central Library, Department of Library and Information Science, Annamalai University, Tamil Nadu, Email- msbau@rediffmail.com

Abstract

The study has focused on the research publication performance of the COVID-19 pandemic in India. The research has covered a standard period of data, which was indexed in Web of Science (WoS). Since COVID-19 was first found in December 2019, Wuhan, in China. Later, it was globally spread and in January 2020 it was found in India (WHO). Therefore, the researchers also collect the data very exclusively i.e. from 2019 to 2021, up to June. A total number of 3024 records are considering for this study. It has been found that India, the USA, England, China, and Singapore had the highest number of research items among other countries. “Indian Journal of Ophthalmology” was the source with the highest number of research items with 99 documents. India is the most superior country in terms of collaborative research with 3024 and 2574 total link strengths. India has received the highest citation 21099 among the top 20 countries out of 133. The top authors were identified in terms of productivity, impact, collaborations, sources, and affiliations with few exceptions mainly from affected regions. The scientometrics analysis presents the descriptive quantitative metrics for Covid-19 pandemic research in India. The result shows that India also provides evidence of the increased global collaboration of research for fighting with COVID 19 pandemic.

Keywords: COVID-19, Novel Coronavirus, Pandemic, Scientific Visualization, Scientometrics Study, India.

1. Introduction

By analyzing the acronym of COVID, its means, CO for Corona, VI for Virus, and D for Disease. This emerged in the Wuhan City of China in 2019 December. Later on, World Health Organization (WHO) declared a novel coronavirus i.e. COVID-19, in December 2019. Far ahead, in February 2020 Coronavirus spread widely around the globe, and the number of cases was increased. Well ahead, it's known as the COVID-19 Pandemic (Malik, Butt, Bashir, & Gilani, 2021). Previously, it was referred to as 2019 “novel coronavirus” or

“2019-nCoV”. Its new virus belongs to the same family of viruses as Severe Acute Respiratory Syndrome (SARS) (Hossain, 2020). In the COVID-19 Pandemic scenario, the health emergency affecting all aspects of life, and became a focal point for research in many academic disciplines. Throughout the World 10% of the population (780 million) COVID 19 suspected cases were found (WHO, Oct 2020). Therefore, the study made a scientometrics analysis for research publication performance of medical literature on the COVID-19 pandemic in India; its main focus is to find out how significantly research has grown in this domain in India. The covid-19 literature was published very limitedly during the study period i.e. from 2019-2021. In further research, more scientific data will be published and the reader could know more about the collaboration countries and organizations' research support of COVID-19 pandemic about India.

1.2 COVID-19 Pandemic in India

COVID 19 is highly affected every aspect of human life and economic growth so far in India. India is mostly affected by the second wave of COVID 19. The World Health Organization's (WHO) website showing the latest cases of “COVID 19” for India i.e. newly affected cases 45,951 and total death cases 3, 98,454. (last updated 01/07/2021).

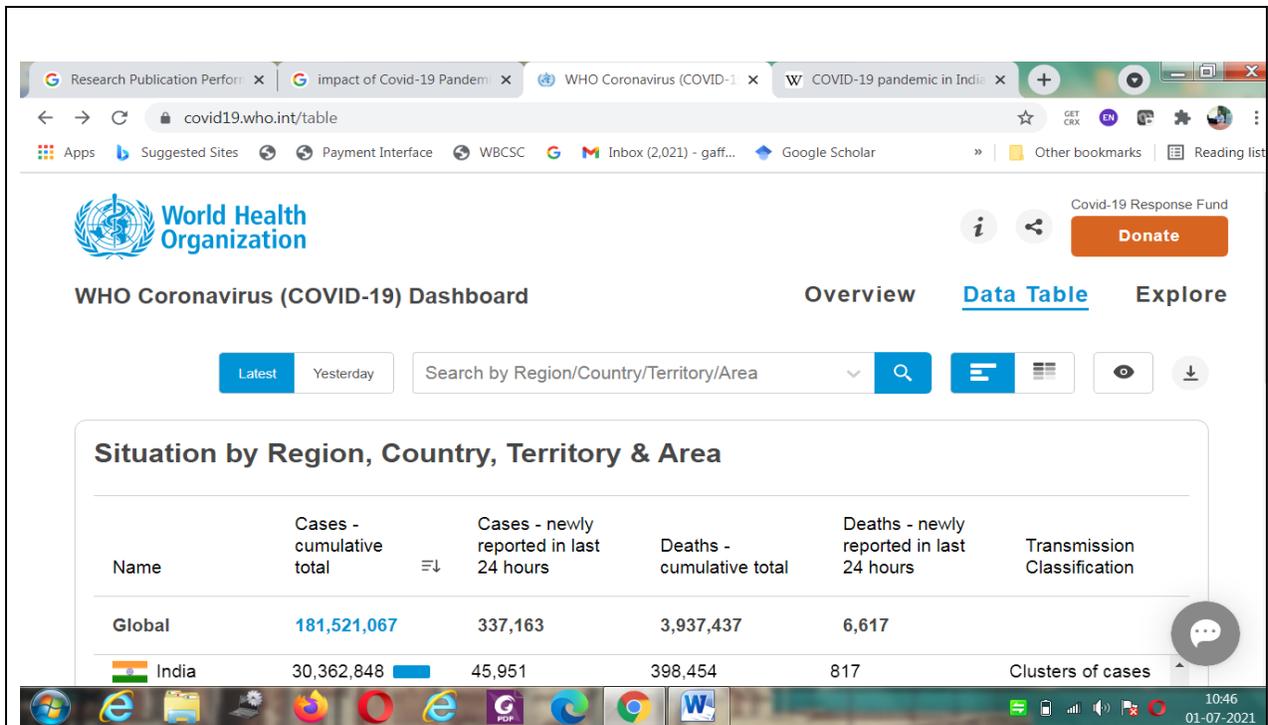


Figure (screenshot): 1 The Coronavirus details cases are displayed in the graph & image by WHO website. (Accessed on 01/07/2021, <https://covid19.who.int/table>)

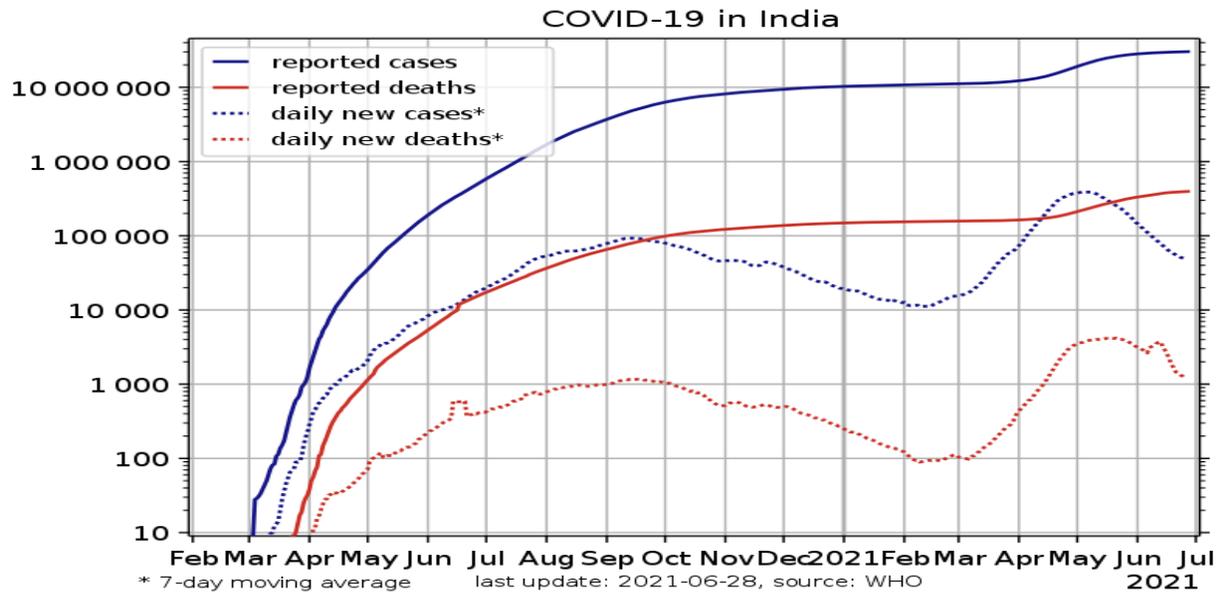


Diagram: 1 showing the number of COVID-19 ("Corona") cases in India. (<https://en.wikipedia.org/wiki/COVID-19>)

Background of the study the study investigates a scientometrics analysis regarding Research Publication Performance of Covid-19 Pandemic in India latest by June 2021. It shows the growth rate of COVID-19 Pandemic scientific literature in India.

Originality/Value of research COVID 19 pandemic worldwide impacted every aspect of human life and this study is very significant in the current scenario to know the growth rate of scientific literature in this domain globally.

Limitation of the study has exclusively scrutinized a total number of 3000 research outputs which has indexed in web of Science in the year 2019-2021, March. On the other hand, documents published in others records/sources web of science have not been covered.

Literature Review

The following literature was reviewed for the study.

Hossain (2020) study carried out the current status of research on COVID 19, data were taken from Web of Science which was published until April 2020. Data were analyzed through "Bibliometrics tools" and "R" software. The study found that the mean number of authors and citations per document was 3.91 and 2.47 and respectively, it was displaying the top ten authors, articles, and journals according to their citation and publication frequency. But the present study has taken the data latest from 2016 to 2021 up to May, and it was displayed the publishing growth rate increased of last two years. **Pal (2020)** investigation found that the last five-month research output of novel coronavirus i.e. 2019 nCov and COVID 19 growth rate was 1600% and published 100 articles per day and its notable that most of the articles published in Medical Science Journal like Lancet, Nature, and BMJ, etc. on the other hand, published articles were contributed by China, USA, Italy, and the UK. The study was examined that

research growth was increased by the Novel coronavirus. **Haghani & Bliemer (2020)** the research has found that the academic publication has been published quickly after a novel coronavirus (COVID 19) outbreak. The study has been taken the last less than 05 months data from WoS and SCOPUS i.e. in the year 2010, May, and it has to exceed the day today. The study focused on COVID-19 and pandemic literature output in the last 05 months in the year 2020. The study analyzed the cytometric aspect regarding Serve Acute Respiratory Syndrome (SARS) and the Middle East acute respiratory syndrome (MERS) 6 these two major coronavirus diseases. It has been found that co-occurrences of key terms, bibliographic coupling and citation relation of the journal and collaborations among the country. The study mainly examined the related to dealing with vaccines and clinical care of these diseases. The present research took the most relevant and latest data i.e. up to May 2021, which is focused on the current growth of the literature on the vaccine and clinical care of COVID 19. **Atlasi (2020)** this study carried out the research output of COVID 19 and related to underlying diseases like diabetes. Data were collected from WoS latest by 2020 and analyzed through VOSViewer and ScientoPay program. A total number of 56,420 data were received among them 309 hot papers were received. Most of the original research paper. Most of the articles were published by the USA and China. The “British Medical Journal” and “Journal of Medical Virology” are ranked accordingly for their research contributions. “The Harvard University” is the top organization for research contribution and The “Lancet” journal top-ranked journal for highly cited paper. **Malik (2020)** the research has been examined the scientific research productivity of coronaviruses and COVID 19. This study has been allayed the last 06 month data in the year 2020, which was indexed in WoS. The research measured the quantity and quality of the publications (28,846) by using the ‘R-Bibliometrics’ package. The Research has found that in the last two decades 39.5% of documents had distributed but last 6 months 2020 it has 46.5% of documents had distributed. Most of the articles were published by the USA and China. The “British Medical Journal” and “Journal of Medical Virology” are ranked accordingly for their research contributions. “The Harvard University” is the top organization for research contribution and The “Lancet” journal top-ranked journal for highly cited paper.

Objectives of the Study

The following objectives have been framed for the study

1. The study found that the total number of research publication output of COVID-19 Pandemic up to till June 2021 in India.
2. The study found that the total number of the country involved in research publication productivity of COVID-19 Pandemic up to June 2021 in India.
3. The study found that the total number of organizations involved in the research publication output of COVID-19 Pandemic up to June 2021 in India
4. The study found that, the growth rate of COVID-19 pandemic literature in the last 03 years i.e. from 2019 to 2021, June in India.

Design/Methodology/approach Authors were adopted tactics to obtain the literature data from the web of science from 2019 to 2021 by using proper keywords related to the domain area of the study. Total numbers of 3028 records

were considering for a short period of substantial growth of the subject domain. The study has presented the scientometrics analysis of global research publication performance of covid-19 pandemic. The visualization tool i.e. VOSviewer is used to construct the country, Institution, and keywords network.

Data analysis and Interpretation

Publication Year

Table 1 the annual trends of Covid-19 pandemic research productivity in India

Year	Articles	Percent(%)
2019	0	0.00
2020	1696	56.08
2021	1328	43.92
Total	3024	100.00

The Covid-19 pandemic in India is a part of the [worldwide pandemic](#) of Covid -19. The first case of Covid -19 in [India](#), which [originated from China](#). Currently, India has the largest number of [confirmed cases in Asia](#) and second largest in the world after the USA with 29.3 million reported cases of Covid -19 infection and the third-highest number of Covid -19 deaths (after the USA and [Brazil](#)) at 367,081 deaths, as of 12 June 2021. Our present study on research productivity on Covid -19 pandemic in India during 2019-2021, identified 3204 publications on Covid -19 pandemic in India. **Table 1** shows that the research output 0 publication in 2019, because the virus was new term. The Indian scientists was unknown that virus. After the year 2020 and 2021, a rapid increase of publications in this subject area. The researcher found in 2020, almost more than half of the publications (56.08%) were published in 2020 followed by 4392% articles published in the current year (2021).

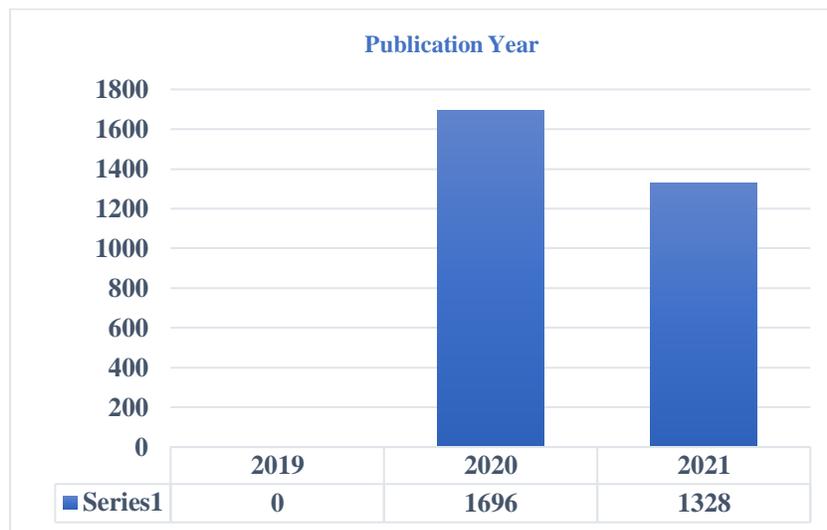


Figure 2. The annual trends of Covid -19 pandemic research

Authorship pattern

Table 2. Authorship Pattern on Covid -19 pandemic

Sl. No.	Documents Written	No. of Author	Percent
1	1 Author	10647	78.17
2	2 Authors	1622	11.91
3	3 Authors	572	4.20
4	4 Authors	312	2.29
5	5 Authors	151	1.11
6	6 Authors	95	0.70
7	7 Authors	50	0.37
8	8 Authors	31	0.23
9	9 Authors	22	0.16
10	10 Authors+	118	0.87
Total		13620	100.00

Table 2 displays the authorship pattern of contributions on Covid -19 pandemic in India. Out of 3024 articles written by 13620 authors all over the countries, a single author has contributed 78.17 percent, 11.91 percent of articles were published with two authors, 4.20 percent of articles were published by three authors, 2.29 percent of the contributions were published by four authors, 1.11 percent of the contributions were published by five authors, 0.70 per cent of the contributions were published by six authors, 0.37 percent of articles were produced by seven authors group, 0.23 percent of articles were from eight authors group, 0.16 percent of articles were contributed by nine authors group and 0.87 percent of articles were published from more than ten authors (2500) group respectively. It is identified from the above table that a substantial number of research articles are single-authored which account for 78.17% (10647) of the total output.

Author co-author citation analysis

Table 3. The top 20 most prolific authors of Covid -19 research top papers

Sl. No.	Author	Documents	Citations	Total Link Strength
1	Dhama, Kuldeep	33	503	52361
2	Tiwari, Ruchi	24	466	48293
3	Malik, Yashpal Singh	16	390	38965
4	Patel, Shailesh Kumar	14	216	30422
5	Rodriguez-morales, Alfonso j.	12	383	33584
6	Sharun, Khan	12	161	18508
7	Rabaan, Ali A.	11	149	23846
8	Sah, Ranjit	11	237	29975
9	Yattoo, Mohd Iqbal	11	152	21759
10	Harapan, Harapan	10	87	11789
11	Bonilla-Aldana, D. Katterine	8	332	26434
12	Pathak, Mamta	7	154	22217
13	Singh, Karam Pal	6	198	19432
14	Bhat, Sudipta	5	184	14637
15	Kevadiya, Bhavesh D.	5	79	8441
16	Sircar, Shubhankar	5	184	14637

17	Herskovitz, Jonathan	4	68	8067
18	Machhi, Jatin	4	68	8067
19	Oleynikov, Maxim D.	4	68	8067
20	Patel, Milankumar	4	68	8067

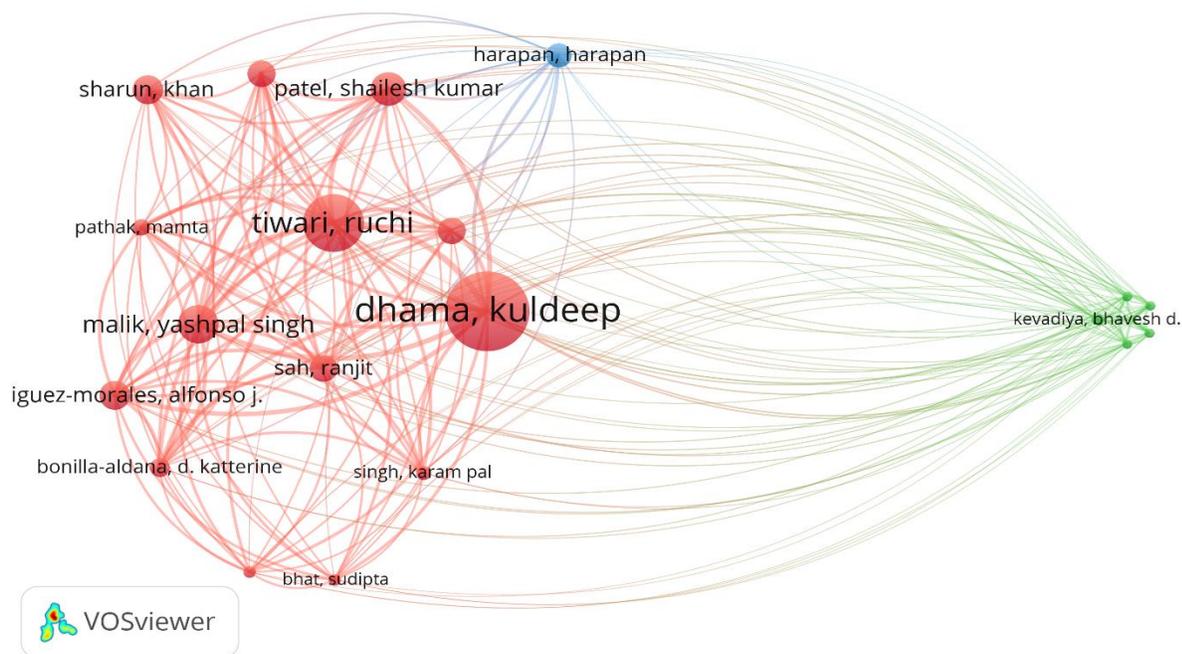


Figure3. Network visu alization Author co-author citation analysis map of Covid -19 research from 2019-2021 for top papers

Author co-citation analysis can be used to identify the relationships among authors on Covid -19 pandemic research. **Figure 2** represents the author co-citation network, meet 992, 4 cluster and 190 links among the top 20 authors. According to author co-citation (**Table 3**), the color of the circles remains the same for the authors in the same cluster having Dhama, Kuldeep was the highly productive author with 33 documents as well as strong collaboration network with other authors with total link strength of 52361 and received highest citations with 503, followed by Tiwari, Ruchi has published 24 articles and received 466 citations and Malik, Yashpal Singh has published 16 articles and received 390 citations.

Sources of COVID-19 pandemic

Table 4. The top 20 sources of Covid -19 pandemic research productivity in India

Sl. No.	Source	Documents	Citations	Total Link Strength	Impact Factor
1	Indian Journal of Ophthalmology	99	460	6	0.92
2	Journal of Biomolecular Structure & Dynamics	95	1293	69	3.549
3	Asian Journal of Psychiatry	53	1723	49	2.529
4	Science of the Total Environment	39	1718	109	6.551

5	Chaos Solitons & Fractals	37	459	5	3.764
6	Frontiers in Public Health	34	166	19	3.02
7	Indian Journal of Medical Research	31	180	13	1.503
8	Indian Journal of Psychiatry	21	178	30	0.398
9	Environment Development and Sustainability	20	118	53	2.33
10	Human Vaccines & Immunotherapeutics	20	71	7	2.619
11	Frontiers in Pharmacology	19	34	25	4.4
12	Frontiers in Psychiatry	18	27	20	3.05
13	Psychiatry Research	16	347	22	3.745
14	Frontiers in Psychology	15	19	18	2.067
15	Aerosol and Air Quality Research	14	77	38	3.32
16	Environmental Research	12	180	35	5.715
17	Life Sciences	12	254	20	3.647
18	Air Quality Atmosphere and Health	11	231	42	2.87
19	Indian Journal of Pharmacology	7	176	20	0.312
20	Journal of Molecular Structure	7	44	18	2.463

The research output in the domain of COVID-19 is scattered across 1085 journals. Based on the WOS bibliographic records, the top 20 journals for Covid -19 research were found (see **Table 4**). We use the VOS viewer software to plot the journal co-citation network. **Figure 3** shows the journal co-citation network with 263 meets, cluster 4 57 links and total link strength 304. As the visualization illustrated in **Figure 3**, each cluster has a color that indicates the group to which the cluster is assigned. We observed all these journals are divided into 4 clusters. In addition, regarding the co-citation frequency, according to sources the top five significant journals were identified, that is, Indian Journal of Ophthalmology (frequency = 99 & citation 460), Journal of Biomolecular Structure & Dynamics (frequency =95 & citation 1293), Asian Journal of Psychiatry (frequency =53 & 1723), Science of the Total Environment (frequency =39 & citation 1718) and this journal highest received citation, and Chaos Solitons & Fractals (frequency=37 & citation 459). From the table, it can be seen the Science of the Total Environment journal has received largest impact factor i.e. 6.551 and second largest impact factor journal is Environmental Research (5.715).

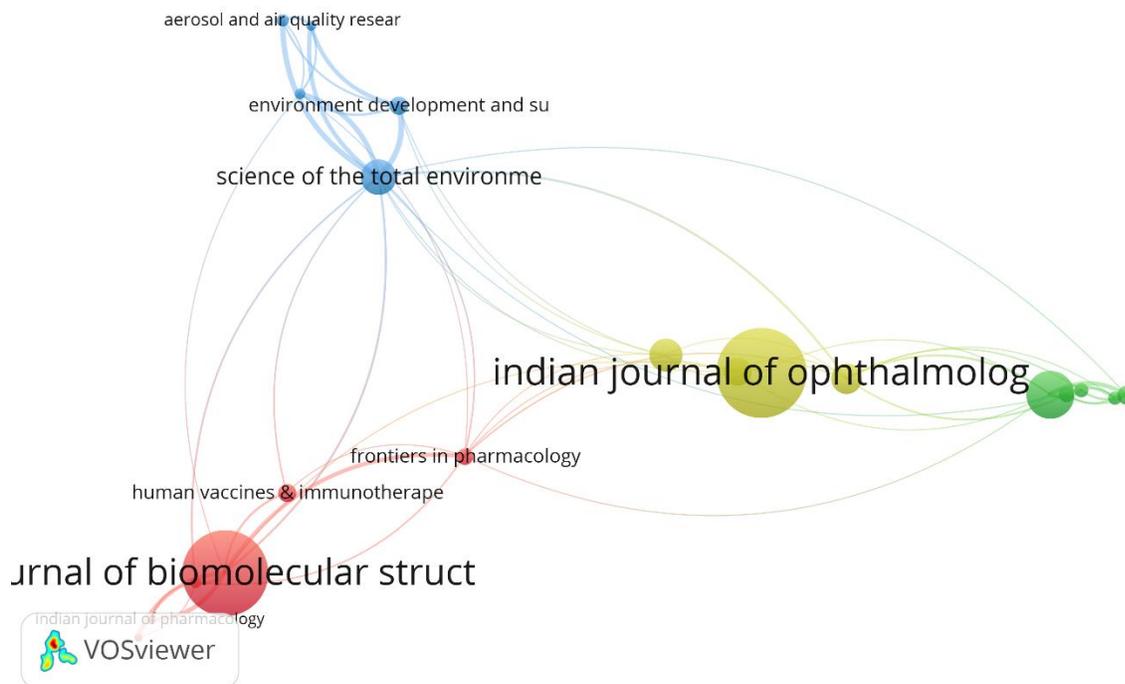


Figure 4. The journals co-authorship network of Covid -19 in India from 2019-2021

Organizations of COVID-19 pandemic

Table 5. The top 20 organizations co-authorship network of Covid -19 pandemic

Sl. No.	Organization	Documents	Citations	Total Link Strength	Country
1	All India Institution Medical Science	278	1192	16	India
2	Chinese University of Hong Kong	30	752	54	China
3	Harvard Medical School	25	255	55	England
4	Mayo Clin	27	124	40	USA
5	Michigan State University	18	170	38	USA
6	Monash Univ	17	107	40	Australia
7	National & Kapodistrian University	15	464	39	Greece
8	National University of Singapore	28	811	37	Singapore
9	New York of University	19	228	35	USA
10	Stanford University	26	298	37	USA
11	University of Cape Town	21	222	27	South Africa
12	University Cattolica Sacro Cuore	11	148	24	Italy
13	University of Manchester	20	140	33	USA
14	University Melbourne	22	405	43	Australia
15	University Oxford	20	159	46	England
16	University Porto	17	229	19	Portugal
17	University Tehran Medical Science	15	137	26	Iran

18	University Toronto	33	334	61	Canada
19	University of Washington	21	160	29	USA
20	Yarmouk University	9	146	23	Jordan

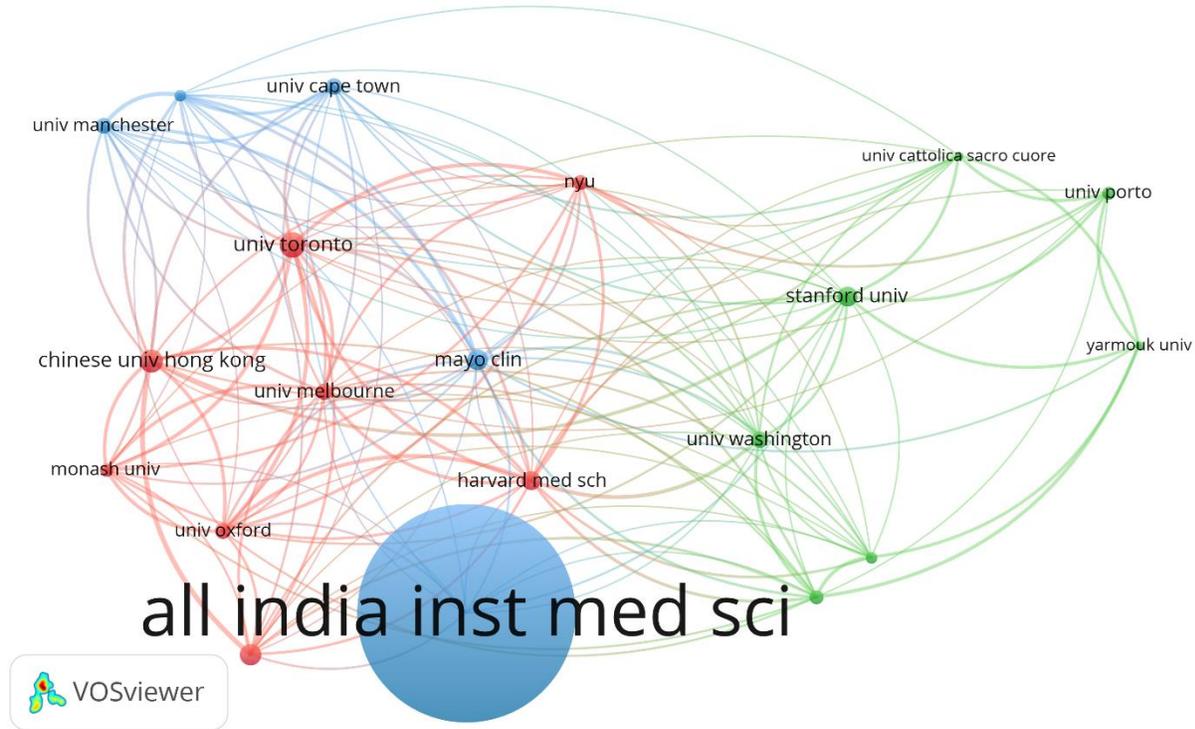


Figure 5. The top 20 organizations co-authorship network of COVID-19 pandemic in India from 2019-2021. The institute co-authorship network is shown in **Figure 4**. The type of analysis was “co-authorship”, the unit of analysis was “organizations”. As well, the “minimum number of documents of an organization” was set to three. **Figure 4** contains a network of organization of 3 cluster and 138 links. **Table 5** shows that the top 20 institutions with large total link strength were the following: All India Institution Medical Science total link strength of 16 and citation 192 with 278 documents. It was found, there are two organizations (National Univ Singapore and New York University) are total link strength is same i.e. 67. The total link strength values of organization emphasize the total strength of the co-authorship links of a given institute with other organizations.

Country of COVID -19 pandemic

Table 6. The top 20 country co-authorship network of COVID-19 pandemic

Sl. No.	Country	Documents	Citations	Total Link Strength
1	India	3108	21099	2574
2	USA	518	4979	1614
3	England	286	2974	1190
4	Peoples R China	181	2138	799
5	Singapore	163	1681	464
6	South Korea	163	1489	434
7	Australia	162	1464	843

8	Italy	117	1457	976
9	Japan	105	1175	484
10	Brazil	101	1130	718
11	Spain	97	1128	635
12	Saudi Arabia	91	1123	437
13	Germany	88	1080	667
14	Netherlands	81	974	483
15	Canada	81	932	639
16	France	76	926	590
17	Iran	73	672	379
18	Egypt	68	625	429
19	South Africa	63	597	432
20	Switzerland	60	364	423

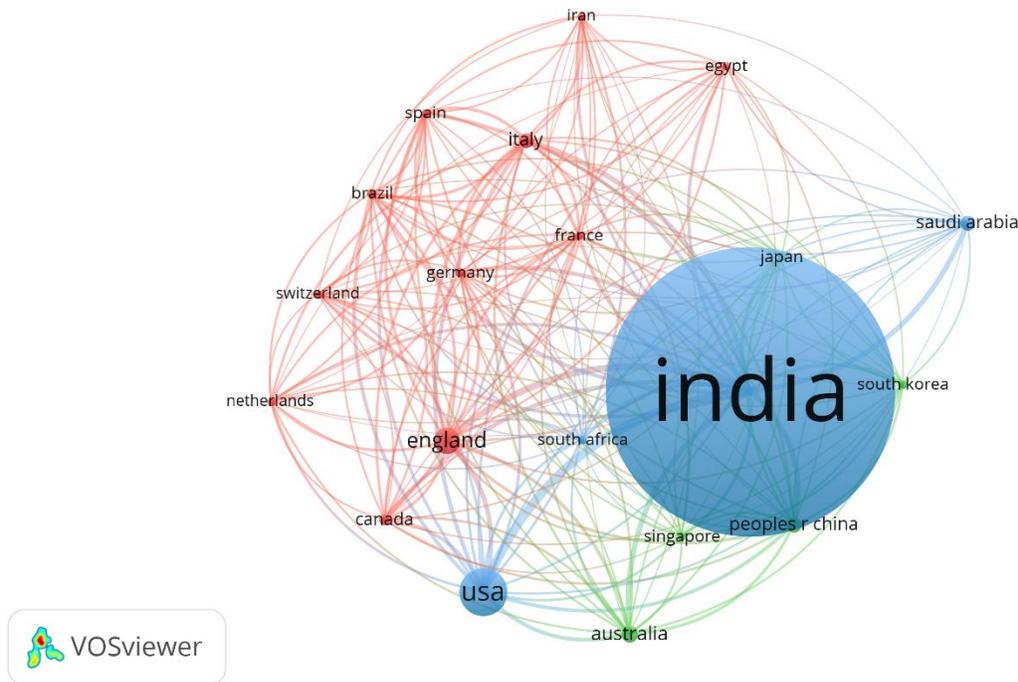


Figure 6. The top 20 country co-authorship network of Covid -19 pandemic in India from 2019-2021

The country Co-authorship network of Covid -19 related publications is showed in **Figure 5**. **Figure 5** contains a network of country 103 meet, and link 190. There are three colors in the map, which shows the diversification of research directions. The big nodes represent the influential countries. The links between nodes represent the cooperative relationships among organizations. The total link strength provides an estimation of the collaborative research of one country with the other countries. The country of India is the most superior country in terms of collaborative research with 3024 and 2574 total link strengths. In the second position was USA with 518 and 1614 total link strength. England has third position with 286 and 1190 total link strength score. China was in the fourth

position in collaborative research. India has received highest citation 21099 among the top 20 countries out of 133 (see **Table 6**).

Keywords co-occurrence analysis on COVID-19

Table 7. The top 20 Keywords co-occurrence analysis of Covid-19 pandemic

Sl. No.	Keyword	Occurrences	Total Link Strength
1	COVID-19	1657	1553
2	Sars-Cov-2	620	846
3	Pandemic	325	504
4	Coronavirus	298	499
5	India	147	218
6	Lockdown	124	158
7	Molecular Docking	70	104
8	Mental Health	55	81
9	Drug Repurposing	49	103
10	Hydroxychloroquine	46	77
11	Deep Learning	45	67
12	Vaccine	45	82
13	Cytokine Storm	41	55
14	Public Health	39	58
15	Epidemiology	38	69
16	Vaccines	38	90
17	Ace2	37	60
18	Machine Learning	34	54
19	Sars	32	58
20	Anxiety	31	44

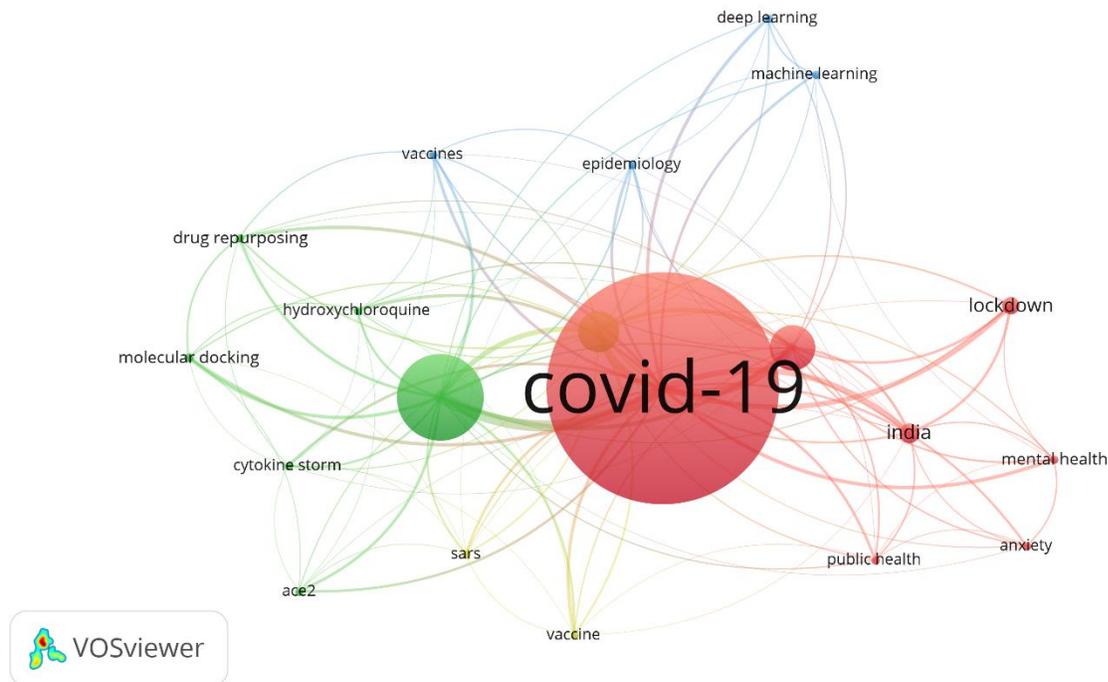


Figure7. VOS viewer co-occurrence network visualization of most frequent all keywords of Covid -19 pandemic in India from 2019-2021

Keyword co-occurrence can effectively reflect the popular topics in the discipline fields and has proven to be important for monitoring the development of science and programs. In this analysis, the relatedness of keywords is determined based on the number of documents in which they occur together. The **figure 6** shows the visualization of the keyword occurrence network of this domain that was formed by selecting those keywords which occurred at least 20 times with 631 meet, cluster 4 and 109 links. The link strength between two nodes refers to the frequency of co-occurrence. **Table 7** shows the top 3 most frequently used keywords are Covid-19 1657 times (with a total link strength of 1553), Sars-cov-2 620 times (with a total link strength of 846), pandemic 325 times (with a total link strength of 504).

Major findings of the study

- India, USA, England, China and Singapore had the highest number of research items among other countries with collaborations
- India is the most superior country in terms of collaborative research with 3024 and 2574 total link strengths.
- In the second position was USA with 518 and 1614 total link strength. England has third position with 286 and 1190 total link strength score. China was in the fourth position in collaborative research.
- India has received highest citation 21099 among the top 20 countries out of 133.
- “Indian Journal of Ophthalmology” was sources with highest number of research items with **99** documents.
- In the year 2019 no article has published from India.

- The top authors were identified in terms of productivity, impact, collaborations, sources, and affiliations with few exceptions mainly from affected regions.
- In the year 2020, more than half of the publications (56.08%) were published and followed by 4392% articles were published in the current year (2021).
- Top five significant journals were identified, that is, Indian Journal of Ophthalmology (frequency = 99 & citation 460), Journal of Biomolecular Structure & Dynamics (frequency =95 & citation 1293), Asian Journal of Psychiatry (frequency =53 & 1723), Science of the Total Environment (frequency =39 & citation 1718) and this journal highest received citation, and Chaos Solitons & Fractals (frequency=37 & citation 459).
- The Science of the total environment journal has received the largest impact factor i.e. 6.551 and second largest impact factor received by journal of environmental research (5.715).
- It is identified from the above table that a substantial number of research articles are single-authored which account for 78.17% (10647) of the total output.
- India is the most superior country in terms of collaborative research with 3024 and 2574 total link strengths.

Conclusion

This study was carried out to analyze all the research articles published in the Web of Science database during 2019-2021 on Covid-19 pandemic research productive in India and to illustrate the most important characteristics of highly cited papers retrieved in this study. With regard to this, the objective of the present study was to collect, record, and illustrate the possibility and extent of the current research on Covid-19 pandemic. Study has identified that the surge in the publications was after the outbreak of the pandemic. The researchers found from the results showed that the countries, with the most affected people and patients more attempt to publish research work and the literature has a high and rapid growth every day on Covid-19 pandemic in India. Our purpose of this study was determining status and overview of all publishing researches related to Covid-19 by researchers and their institutions, research area, the sources, countries, or authors with the most published documents, and also whole details of the published hot documents. This information works more seriously on this disease and may be useful to conduct current or future research on the best topics and gaps in this disease and to gain access to top positions among other documents and publications.

Acknowledgments: The authors would like to acknowledge the authorities Clarivate Analytics of Web of Science (WoS) for using the data for this valuable research purpose.

References

1. Haghani, M., & Bliemer, M. C. J. (2020). Covid-19 pandemic and the unprecedented mobilisation of scholarly efforts prompted by a health crisis: Scientometric comparisons across SARS, MERS and 2019-nCoV literature. In *Scientometrics* (Vol. 125). <https://doi.org/10.1007/s11192-020-03706-z>
2. Malik, A. A., Butt, N. S., Bashir, M. A., & Gilani, S. A. (2021). A scientometric analysis on coronaviruses research (1900–2020): Time for a continuous, cooperative and global approach. *Journal of Infection and Public Health*, 14(3), 311–319. <https://doi.org/10.1016/j.jiph.2020.12.008>
3. Pal, J. K. (2021). Visualizing the knowledge outburst in global research on COVID-19. *Scientometrics*, 126(5), 4173–4193. <https://doi.org/10.1007/s11192-021-03912-3>
4. Preprint on Preprint. (2020). (May), 1–12.
5. Gaffar, S. A., Kumar, S. K., & Hossain, S. (2020). Research Productivity of Tourism Literature (Global Level): A Scientometric Analysis. *Library Philosophy and Practice*, 2020, 1–16. DOI: 10.1142/9789814415
6. Hossain, M. M.: Current status of global research on novel coronavirus disease (Covid-19): A bibliometric analysis and knowledge mapping. version1(2020). DOI:10.2139/ssrn.3547824.
8. Grammes, et al.: Research Output and International Cooperation Among Countries During the COVID-19 Pandemic: Scientometric Analysis. *Journal of medical Internet Research*. 22, (2020). DOI: 10.2196/24514
10. Coronavirus disease 2019 (COVID-19), <https://en.wikipedia.org/wiki/COVID-19>
11. COVID-19 Pandemic In India. https://en.wikipedia.org/wiki/COVID-19_pandemic_in_India
12. WHO Coronavirus (COVID-19) Dashboard. <https://www.who.int/countries/ind/>
13. Logarithmic Scale. For related diagrams and data sources see. User:Hbf878#COVID-19. https://en.wikipedia.org/wiki/COVID-19_pandemic_in_India#/media/File:COVID-19-India-log.svg
14. Map COVID-19 deaths in India. (MoHFW). Report in accuracy https://en.wikipedia.org/wiki/COVID19_pandemic_in_India#/media/File:India_COVID-19_deaths_map.svg