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Bibliometric Landscape of Indian Publications on COVID-19 in 2020

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1. Introduction :

A new form of infectious and contagious disease caused by novel corona virus (SARS-CoV2) named as COVID-19 declared in late December 2019 in Wuhan, China and with the rapid transmission of the virus from human to human worldwide turned into pandemic in 2020 led to existential threat to human civilization witnessed through dramatic loss of human life. The political, social and economic disruption caused by the pandemic slowed down the development of each and every county and the world as a whole. COVID-19 spread conveyed alarming message to the densely populated country like India. Scientists, Specialists and Researchers across the world concentrated on researches to control high infection rate of COVID-19 and find a way out to get relief of the venerable situation, resulted massive growth of publications on the topic "COVID-19" noticed in the year 2020. Many premier academic and research institutions from India like other leading countries took dedicated effort to contribute on the infection symptoms, effective protocol of testing in view of the changing characteristics of the virus in varied geographical region, early diagnosis, proper treatment and other relevant issues.

Bibliometric study may be considered as a commonly accepted tool to evaluate publication trend of a particular research topic/field quantitatively and qualitatively. The study attempts to provide a bibliometric landscape of Indian publications on the topic "COVID-19" as indexed in Web of Science (WOS) for the year 2020 and retrieved on 29th April, 2021 with analysis on the trend of Indian publications in the global race, citation, h-index, publication type, prolific authors, authorship pattern, degree of collaboration, most preferred journals, publishers, top rated research institutions and research fields under WOS categories.

2. Literature Review :

The literature review is a survey of published documents on previous research on relevant topic which extends basic guidance to the present study. Though several studies are conducted on analyzing research productivity, bibliometric study, citation impact on different research areas, performance of different countries, institutions, authors but the productivity analysis or bibliometric study on COVID-19 are found to be minimum for new emergence of the instant topic from the last date of 2019. A few such studies deserve mention are as under :

- i. **Chahrour, M, et al.** (2020) ^[1] assessed the activity and trends of COVID-19 research and research output exploring the PubMed database and the World Health Organization (WHO) database since December 2019 up until March 18, 2020.
- ii. **Kappi, M, et al.** (2021) ^[2] made a bibliometric evaluation on world COVID-19 publication retrieving data from Web of Science on September 10, 2020.
- iii. **Wang, P and Tian, D,** (2021) ^[3] analyzed global trends in COVID-19 research and literature officially published as included in the Web of Science (WOS) database taking into consideration author, institution, country and research category.
- iv. **Zyoud, S and Al-Jabi, S W,** (2020) ^[4] attempted to gauge the global scientific output of COVID-19 research the extracting data from the Scopus database during the early stage of the outbreak by using well-established bibliometric indices: document type, country, collaboration patterns, affiliation, journal name, and citation patterns.
- v. **Maharana** (2013) ^[5] analyzed the growth, contribution and impact of research carried out by the researchers at the Orissa University of Agricultural Technology (OUAT), Bhubaneswar based on the publications indexed in SCOPUS during 2008 to 2012.
- vi. **Hadimani et. al.**(2015) ^[6] conducted bibliometric analysis on research publications of IISER (Indian Institute of Science Education and Research), Thiruvananthapuram, India with the support of Web of Science database for the period from 2008-13.
- vii. **Mandhirasalam** (2016) ^[7] performed a scientometric study on publication output of PSG College of Technology (PSGCT), Coimbatore for the period from 1971 to 2014 based on SCOPUS database.
- viii. **Kumar** (2020) ^[8] initiated a study to find out the progress in the research productivity of Indian Institute of Technology (Indian School of Mines) Dhanbad for the period of twenty years (2000-2019) and revealed the notable rise in research publication during the period of study.

ix. **Subramanyam**(1983)^[9] proposed bibliometric methods offer a convenient and non-reactive tool for studying collaboration in research.

3. Objectives :

- To measure the status of Indian publications in the trend of global publications on the topic “COVID-19” in the year 2020;
- To examine the citation profile of Indian publications and gauge the citation impact in terms of h-index covering the period of study;
- To review the prolific authors, authorship pattern, degree of collaboration, most preferred journals with publishers;
- To measure the top rated research institutions on the topic “COVID-19” with research fields under WOS categories.

4. Research Limitations/Implications:

As the unknown viral disease identified as novel corona virus named as COVID-19 on the last day of 2019 with no standard treatment protocol worldwide saturated the global health care system due to high rate of infectivity. Extensive research on observational studies for assessing pathogenic characteristics, clinical feature, treatment strategies for patients with COVID-19 and other relevant issues sprung up, resulted exponential growth of publications across the world from 2020. Indian researchers took dedicated initiative to contribute on the topic “COVID-19” like other leading countries of the world. The study is limited to Indian Publications on COVID-19 in the year 2020 as indexed in the Web of Science.

5. Methodology :

The data of Indian publication on the topic “COVID-19” extracted from Web of Science database for the year 2020 on 29th April, 2021 for interpretation using search -

TOPIC: (COVID-19) AND YEAR PUBLISHED: (2020) Refined by: COUNTRIES/REGIONS: (INDIA).

Subsequently, MS-Excel used for the analysis of data.

6. Data Analysis and Interpretation

• Publication Details

According to the data retrieved from the Web of Science (WOS), 62755 documents published at the global level on the topic “COVID-19” in the year 2020 where USA achieved 1st Rank for maximum publications of 18785 documents achieved, China ranked 2nd publishing 8136 documents, Italy (3rd) and England (4th) published 6622 and 6581 documents respectively. India occupied 5th position publishing 3104 documents on COVID-19.

Table 1 : Country-wise Ranking of Publications on COVID-19

Countries	Documents Published	%	Rank
USA	18,785	29.93%	1
China	8,136	12.96%	2
Italy	6,622	10.55%	3
England	6,581	10.49%	4
India	3,104	4.95%	5
Rest of the countries	19,527	31.12%	
Total Publications	62,755	100.00	

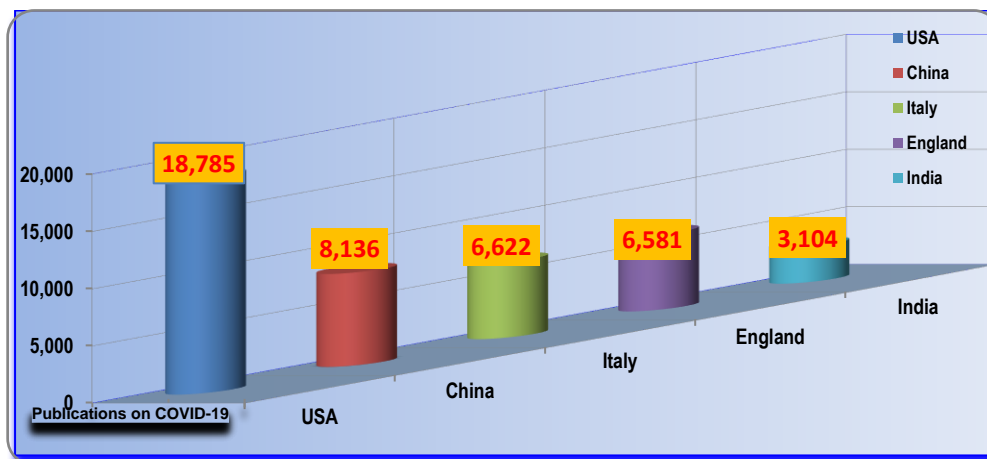


Fig. 1: Country-wise Ranking of Publications on COVID-19

- **Document Types**

The research contents published under different types of documents to bring the publications available to the relevant audience for study, review, reference etc. Web of Science (WOS) categorizes indexed contents into specific “document type” category. Table-2 focused the various types of documents published by Indian author on COVID-19 in the year 2020 with chart in Fig. 2.

Table 2 : Types of Documents Published by Indian Author on COVID-19

Document Types	Pub. Counts	% on TP-3104
Articles	1431	46.10
Letters	776	25.00
Review Articles	530	17.08
Editorial Materials	329	10.60
Others	38	1.22

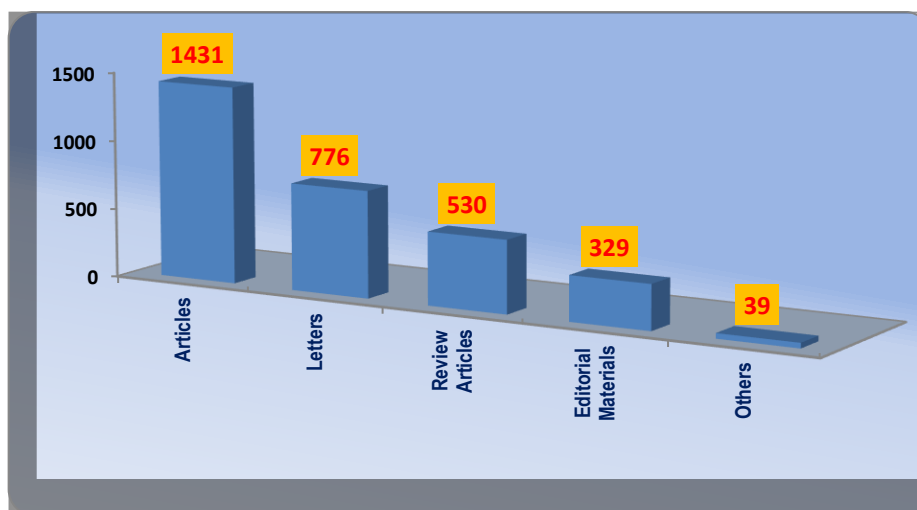


Fig. 2 : Types of Documents Published by Indian Author on COVID-19

- **Citation Profile**

The citation based measurements of Indian publication on the topic “COVID-19” with h-index covering the time span of 1 year (2020) presented in Table-3 and drawn in Fig.3.

Table 3 : Citation Profile of Indian Publication on COVID-19

Year	TP	TC	CP	ACPP	h-index
2020	3,104	23,749	15,401	7.65	57

TP : Total Publications; TC : Total Citations; CA : Citing Publications; ACP Average Citation Per Publication

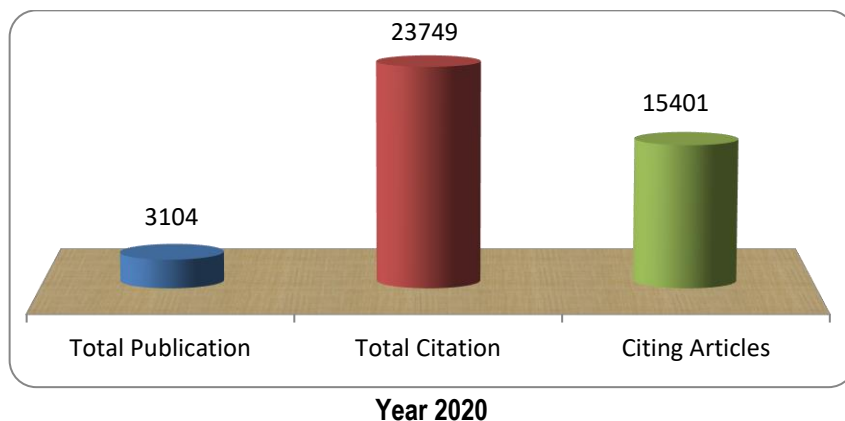


Fig. 3 : Citation Profile of Indian Publication on COVID-19

- **Prolific Authors :**

Out of individual contribution from India, Wiwanitkit, V. published 89 documents, i.e. 2.86% of the total Indian publications on “COVID-19” (TP-3104) in the year 2020 and ranked 1. The second highest contributor, Kumar, A. published 85 documents (2.73%) followed by Kumar, S. with 67 documents (2.16%) ranked 3. The contribution of other prolific authors listed in Table-4 as per the rank based on publication counts and plotted in Fig.4.

Table 4 : Prolific Indian Authors as per Publication Counts on COVID-19 (Top 10)

Authors	Pub. Counts	% on TP-3104	Ranking
Wiwanitkit, V.	89	2.86	1
Kumar, A.	85	2.73	2
Kumar, S.	67	2.16	3
Sharma, S.	45	1.45	4
Singh, S.	45	1.45	4
Dhama, K.	44	1.41	5
Gupta, S.	42	1.35	6
Sharma, A.	42	1.35	6
Sharma, P.	40	1.28	7
Kumar, P.	39	1.25	8

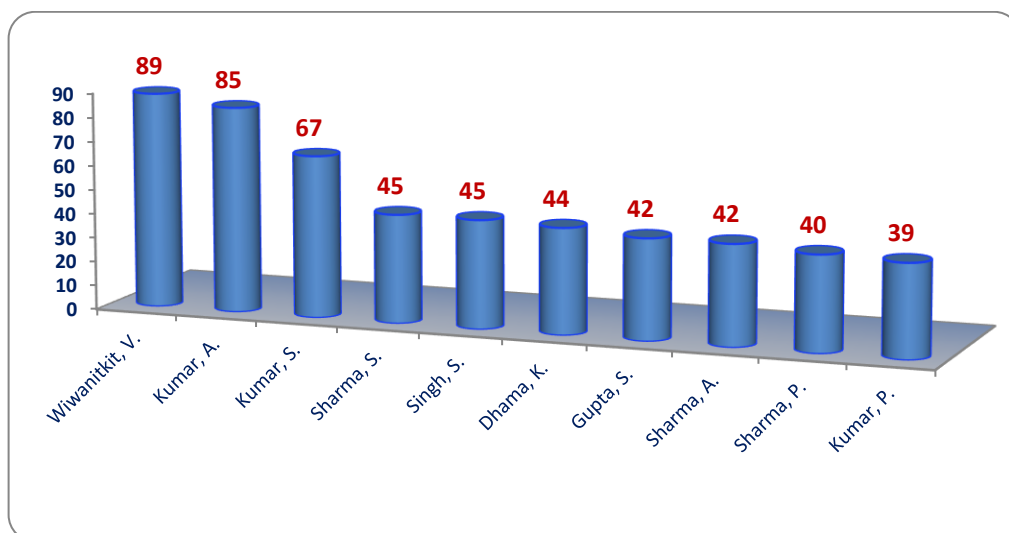


Fig 4 : Prolific Indian Authors on COVID-19

- Authorship Pattern :**

Table-5 and Fig.5 projected the authorship pattern of Indian publications on “COVID-19” in the year 2020 indicated that out of 3104 publications majority research articles published in a collaborative way, i.e. Multi-authored publications 2848 (91.75%) and the single authorship contribution counted only 256 (8.24%).

Table 5 : Authorship Pattern of Indian Publications on “COVID-19” in the year 2020

Year	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	>Ten	Total
2020	256	582	515	404	306	252	170	124	82	78	335	3104
%	8.25	18.75	16.59	13.02	9.86	8.12	5.48	3.99	2.64	2.51	10.79	100

As entered in the table and highlighted in the figure, the highest publications appeared with two authors (582 – 18.75% of total COVID-19 publications) followed by three authors (515 – 16.59%) and four authors (404-13.01%). Publications with ten authors and above ten found 78(2.51%) and 335 (10.79%) numbers respectively.

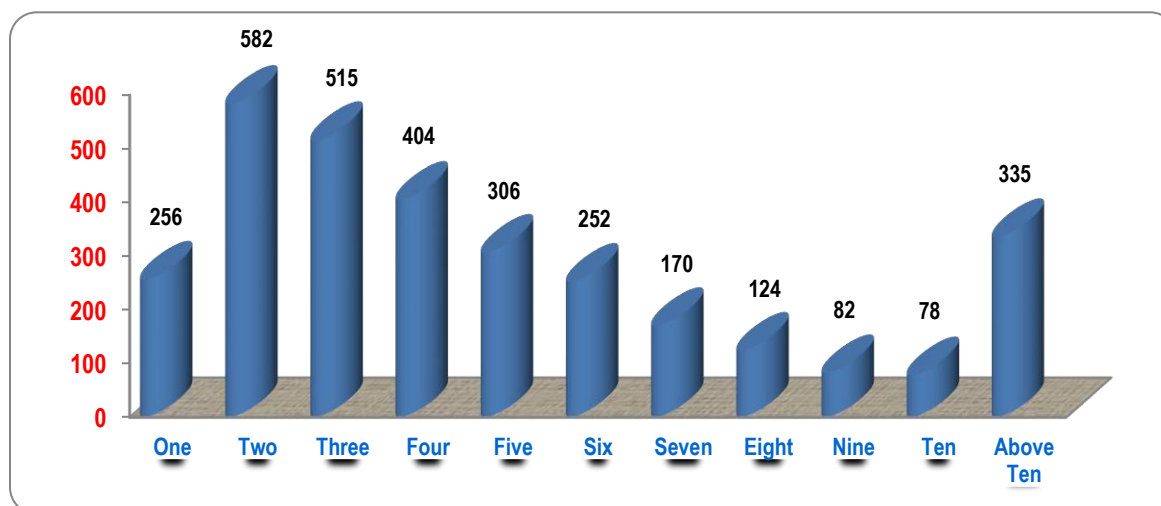


Fig 5 : Authorship Patter of COVID-19 Publications in 2020

- **Degree of Collaboration**

Collaboration in research can be considered very essential to increase the growth of publication. The authorship collaboration of Indian publications on COVID-19 during the period of study measured with the following formula suggested by Subramanyam (1982) :

$$DC = N_M / N_M + N_S$$

where

DC = Degree of Collaboration

N_S = Number of Single Authors

N_M = Number of Multiple Authors

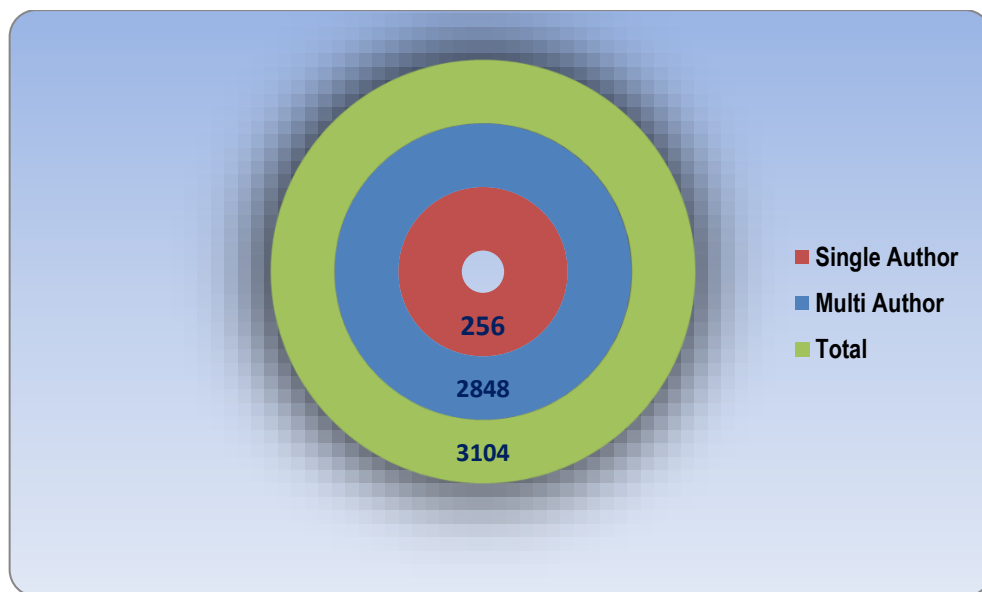


Fig 6 : Degree of Collaboration of COVID-19 Publications in 2020

Table 6 revealed the number of collaborative publications to the total number of publications on the topic “COVID-19” in 2020 with display in Fig 6, the degree of collaboration found 0.92.

Table 6 : Degree of Collaboration of COVID-19 Publications in 2020

Year	Articles of Single Author (N _S)	Articles of Multiple Authors (N _M)	Total (N _S + N _M)	Degree of Collaboration (DC)
2020	256	2848	3104	0.92

- **Prolific Indian Institutions on COVID-19 Publications in 2020**

Top 10 productive Indian Institutions on “COVID-19” publication in the reported year displayed in descending order as per the publication counts in Table 7 and sketched in Fig. 7. Out of the total Indian publications of 3104 in the year 2020, All India Institute of Medical Sciences (AIIMS), New Delhi with 229 publications (7.37%) achieved the top rank followed by Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh with 207 publications (6.66%). Indian Institutes of Technology (IITs) with 176 publications (5.67%) placed in 3rd rank for the contributions on “COVID-19”. The other top rated Indian Institutions are listed in Table 7 as per the count of publications.

Table 7 : Prolific Indian Institutions on COVID-19 Publications in 2020 (Top 10)

Indian Institutions	Pub. Counts	% of TP-3104	Ranking
All India Institute of Medical Sciences (AIIMS), New Delhi	229	7.37	1
Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh	207	6.66	2
Indian Institutes of Technology (IITs)	176	5.67	3
Dr. D.Y. Patil Vidyapeeth, Pune	101	3.25	4
National Institute of Mental Health Neurosciences, India	75	2.41	5
Council of Scientific Industrial Research (CSIR), India	72	2.32	6
Manipal Academy of Higher Education (MAHE), India	72	2.32	6
Indian Council of Agricultural Research (ICAR)	70	2.25	7
Indian Council of Medical Research, ICMR	61	1.96	8
National Institutes of Technology (NITs)	59	1.90	9

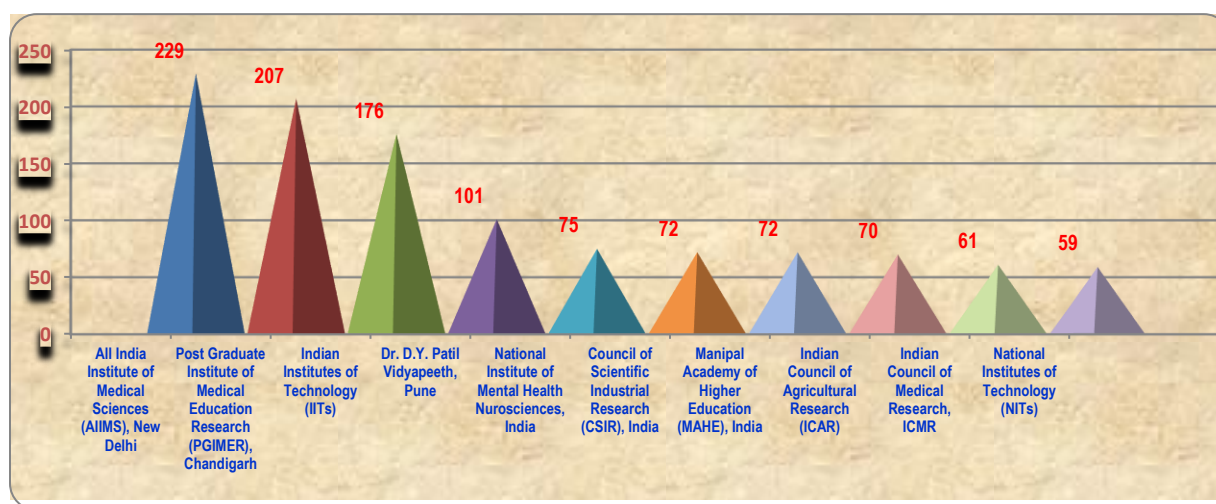


Fig 7 : Prolific Indian Institutions on COVID-19 Publications

• **Preferred Journals by Indian Authors :**

The top 10 preferred journals by Indian authors in respect to the publications on the topic “COVID-19” in the year 2020 listed in Table 8 and displayed in Fig. 8. Journal of Biomolecular Structure Dynamics topped the list with 131 publications (4.22%) on “COVID-19” followed by Indian Journal of Ophthalmology (2nd) and Asian Journal of Psychiatry (3rd) with 101 (3.25%) and 93 (2.99%) publications respectively. Rest of the journals arranged and ranked according to publication counts.

Table 8 : Preferred Journals by Indian Authors (Top 10)

Journals	Pub. Counts	% of TP-3104	Ranking
Journal of Biomolecular Structure Dynamics	131	4.22	1
Indian Journal of Ophthalmology	101	3.25	2
Asian Journal of Psychiatry	93	2.99	3
Indian Pediatrics	59	1.90	4
Dermatologic Therapy	52	1.67	5
Indian Journal of Medical Research	52	1.67	5
Chaos Solitons Fractals	43	1.38	6
Indian Journal of Pediatrics	41	1.32	7
Indian Journal of Surgery	36	1.16	8
Journal of Medical Virology	36	1.12	9

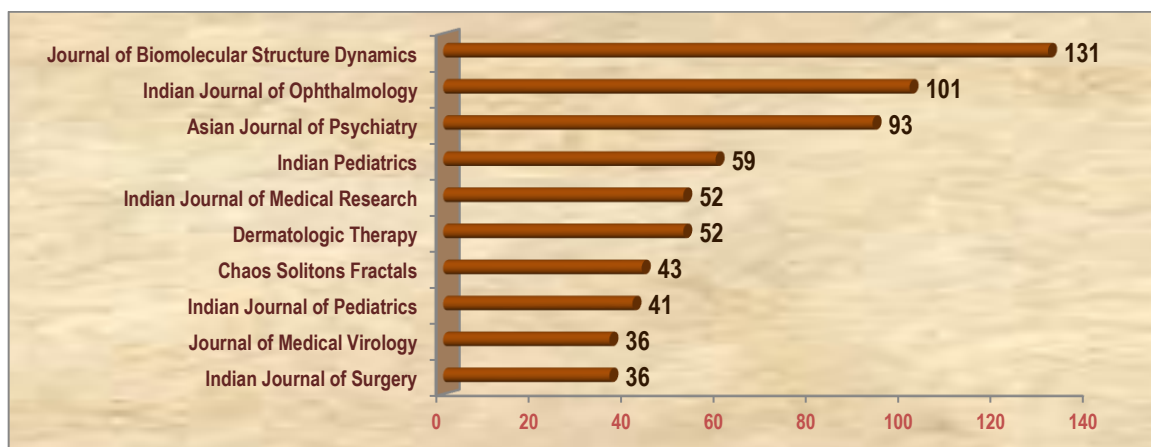


Fig 8 : Preferred Journals by Indian Authors

• **Preferred Publishers :**

Among the documents published by Indian authors on “COVID-19” in the year 2020, the name of the most preferred publishers (top 10) arranged in Table 9 and drawn in Fig. 9. The renowned publisher Elsevier occupied the top most position for 760 publications (24.48% of TP) on “COVID-19” in the year 2020. The Springer Nature and Wiley achieved 2nd and 3rd position for the publication of 525 (16.91%) and 359 (11.56%) documents respectively. The other renowned and preferred publishers ranked as per the publication counts of the respective year.

Table 9 : Preferred Publishers of Indian Publications on COVID-19 (Top 10)

Publishers	Pub. Counts	% of TP-3104	Ranking
Elsevier	760	24.48	1
Springer Nature	525	16.91	2
Wiley	359	11.56	3
Wolters Kluwer Medknow Publications	289	9.31	4
Taylor & Francis	280	9.02	5
Frontiers Media Sa	102	3.28	6
Sage	80	2.57	7
Mdpi	53	1.70	8
Indian Acad Sciences	43	1.38	9
Bmj Publishing Group	38	1.22	10

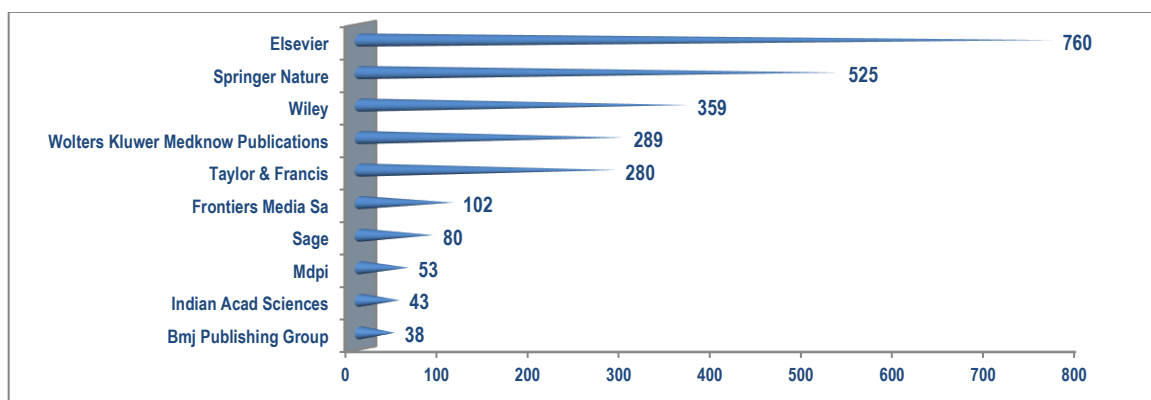


Fig. 9 : Preferred Publishers of Indian Publications

- **Research Field of COVID-19 Publications**

Publications by Indian authors on “COVID-19” in different research field as categorized by WOS listed in Table 10 and graphed in Fig. 10 as per publication counts in descending order.

Table 10 : Research Fields of Indian Publications on COVID-19 (Top 10)

Research Fields – WOS Categories	Pub. Counts	% of TP-3104	Ranking
Biochemistry Molecular Biology	247	7.95	1
Public Environmental Occupational Health	234	7.53	2
Psychiatry	229	7.24	3
Medicine Research Experimental	187	6.02	4
Surgery	172	5.54	5
Immunology	170	5.47	6
Biophysics	166	5.34	7
Medicine General Internet	164	5.28	8
Pharmacology Pharmacy	155	4.99	9
Environmental Sciences	147	4.73	10

Publications on “COVID-19” in the research field of Biochemistry Molecular Biology with 247 counts (7.95%) identified rank 1, Public Environmental Occupational Health covered 234 publications (7.53%) ranked 2 and the 3rd position held by the research field of Psychiatry with 229 counts (7.24%). The other top research fields relevant to “COVID-19” publications recorded in the table as well as figure according to the number of publications.

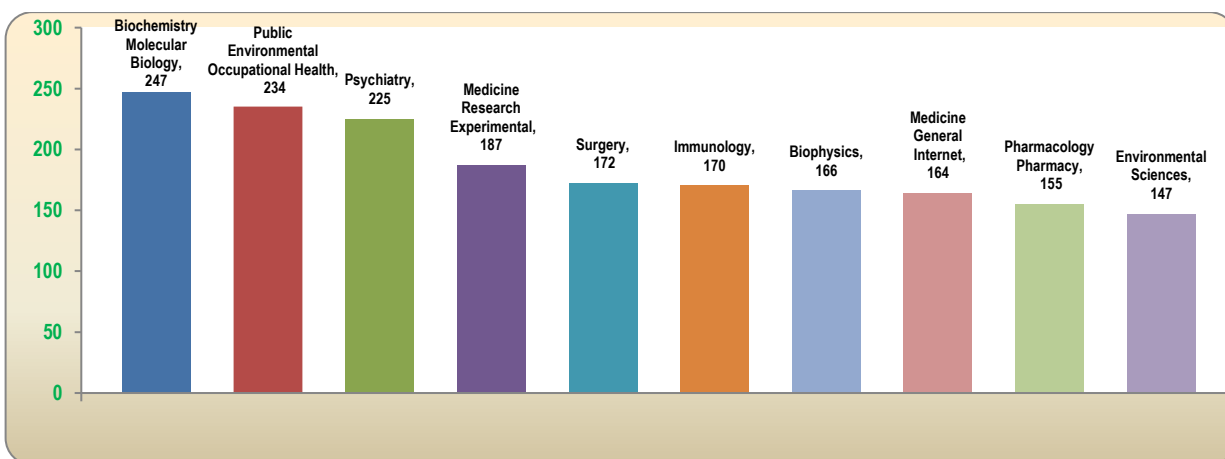


Fig 10 : Research Fields of Indian Publications on COVID-19 (Top 10)

- **Research Findings**

- 1) While measuring country-wise performance out of the global publications (GP - 62,755) on “COVID-19” in the year 2020, USA achieved 1st Rank with 18,785 publications (i.e. 29.93% of GP) followed by China (2nd Rank – 8,136 publications – 12.96% of GP), Italy (3rd Rank – 6,622 publication – 10.55% of GP) and England (4th Rank – 6,581 publications – 10.49% of GP). India occupied 5th position with 3,104 publications (4.95% of GP).
- 2) The publications by Indian author (TP-3104) on COVID-19 in the year 2020, comprises of Articles 1431 (46.10%), Letters 776 (25.00%), Review Articles 530 (17.08%), Editorial Materials 329 (10.60%) and others 38(1.22%). The maximum number of publications found in the form of articles followed by letters, review articles and editorial materials.

- 3) The study on Indian Publications on “COVID-19” covered for the year 2020 considering the rapid transmission of the virus from human to human worldwide turned into pandemic in the beginning of the year resulted involvement in research as well as exponential growth in publications on the said topic. The citation profile of 3104 Indian Publications on “COVID-19” covered Total Citations-23,749, Citing Publications-15,401 and h-index-57.
- 4) Among top 10 prolific Indian authors on “COVID-19” publications, Wiwanitkit, V. ranked 1 publishing 89 documents, i.e. 2.86% of the total Indian publications on “COVID-19” (TP-3104) in the year 2020. The second highest contributor, Kumar, A. published 85 documents (2.73%) followed by Kumar, S. with 67 documents (2.16%) ranked 3. The 4th position held by Sharma, S. and Singh, S. publishing 45 documents each. The 5th rank achieved by Dhama, K with 44 publications (1.41%) followed by Gupta, S and Sharma, A with 42 publications each ranked 6th. Sharma, P and Kumar P occupied 7th and 8th rank publishing 40 (1.28%) and 39 (1.25%) documents respectively.
- 5) The authorship pattern of Indian publications on “COVID-19” in the year 2020 indicated that out of 3104 publications majority research articles published in a collaborative way, i.e. Multi-authored publications 2848 (91.75%). The single authorship contribution counted only 256 (8.24%), two authors 582 (18.75%), three authors 515 (16.59%), four authors 404 (13.02%), five authors 306 (9.86%), six authors 252 (8.12%), seven authors 170 (5.48%), eight authors 124 (3.99%), nine authors 82 (2.64%). Publications with ten authors and above ten found 78 (2.51%) and 335 (10.79%) counts respectively.
- 6) Considering the number of collaborative publications to the total number of publications on the topic “COVID-19” in 2020, the degree of collaboration found 0.92.
- 7) Out of the total Indian publications of 3104 in the year 2020, All India Institute of Medical Sciences (AIIMS), New Delhi with 229 publications (7.37%) achieved the top rank followed by Post Graduate Institute of Medical Education Research (PGIMER), Chandigarh with 207 publications (6.66%) ranked 2. Indian Institutes of Technology (IITs) with 176 publications (5.67%) placed in 3rd rank for the contributions on “COVID-19”. The subsequent ranks held by Dr. D. Y. Patil Vidyapeeth, Pune (101 publications, 3.25% of TP, Rank 4), National Institute of Mental Health Neurosciences, India (75 publications, 2.41%, Rank 5), Council of Scientific Industrial Research (CSIR), India and Manipal Academy of Higher Education (MAHE), India ranked 6 with 72 publications each, Indian Council of Agricultural Research (ICAR) Indian Council of Medical Research (ICMR) and National Institutes of Technology (NITs) acquired 7th, 8th and 9th position publishing 70 (2.25%), 61(1.96%) and 59(1.90%) documents respectively.
- 8) The top 10 preferred journals by Indian authors in respect to the publications on the topic “COVID-19” in the year 2020 ranked taking into account the publication counts. The Journal of Biomolecular Structure Dynamics Ranked 1 with 131 publications (4.22%) on “COVID-19” followed by Indian Journal of Ophthalmology (2nd) and Asian Journal of Psychiatry (3rd) with 101 (3.25%) and 93 (2.99%) publications respectively. The ranking of other journals like Indian Pediatrics (Publications 59(1.90%) Rank-4), Dermatologic Therapy and Indian Journal of Medical Research with 52 publications each, ranked 5. The journals Chaos Solitons Fractals (6th), Indian Journal of Pediatrics (7th), Indian Journal of Surgery (8th) Journal of Medical Virology (9th) ranked according to publication counts.

- 9) Among top 10 preferred publishers of Indian publications on “COVID-19” Elsevier occupied the top position for 760 publications (24.48% of TP) on “COVID-19” in the year 2020. The Springer Nature and Wiley achieved 2nd and 3rd position for the publication of 525 (16.91%) and 359 (11.56%) documents respectively. The other renowned and preferred publishers ranked as per the publication counts of the respective year. Wolters Kluwer Medknow Publications and Taylor & Francis published 289 (9.31%) and 280 (9.02%) ranked 4th and 5th respectively. Frontiers Media Sa with 102 documents (3.28%) held 6th, Sage publishing 80 documents (2.57%) ranked 7th followed by Mdpi in 8th position with 53 (1.70%) publications. Indian Acad. Sciences and Bmj Publishing Group published 43 (1.38%) and 38 (1.22%) documents obtained 9th and 10th rank respectively.
- 10) Publications on “COVID-19” in the research field of Biochemistry Molecular Biology with 247 counts (7.95%) identified rank 1, Public Environmental Occupational Health covered 234 publications (7.53%) ranked 2 and the 3rd position held by the research field of Psychiatry with 229 counts (7.24%). The other top research fields relevant to “COVID-19” publications recorded 4th position for Medicine Research Experimental with 187 documents (6.02%), 5th and 6th position for Surgery and Immunology publishing 172 (5.54%) and 170 (5.47%) respectively. Publications in the research fields of Biophysics, Medicine General Internet, Pharmacology Pharmacy and Environmental Sciences with 166 (5.34%), 164(5.28%), 155(4.99%) and 147(4.73%) ranked 7th, 8th, 9th and 10th position respectively.

7. Conclusion

Growth of publications on rapid progression of COVID-19 based on research, case study, test and monitoring held to establish a fruitful guidelines to some extent regarding infection prevention and control, early investigation protocol, clinical care and management, considerations for treatment of COVID-19 patient from asymptomatic to critically ill. Further research on changing characteristics of virus, treatment, vaccination, medicine and other relevant issues found to be a continuous process followed by constant publications on “COVID-19” in the subsequent years. The scope of comparative bibliometric analysis of Indian Publications in the trend of global productivity on “COVID-19” from 2020 onwards can be undertaken in future.

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