Spring 5-21-2021

Covid-19 Therapy and Treatment: A Scientometric Study of Indian Publications

Surulinathi Muthuraj
Bharathidasan University, surulinathi@gmail.com

Duraipandi R.
Jawaharlal Nehru University, durai2@yahoo.com

Jayasuriya T
wwwsuriyanathi@gmail.com

Srinivasaragavan S
Bharathidasan University, bdulib@gmail.com

Covid-19 Therapy and Treatment: A Scientometric Study of Indian Publications

Surulinathi, M., Assistant Professor,
Duraipandi, R., Assistant Librarian,
Jayasuriya, T., II year MLIS,
Srinivasaragavan, S., Professor and Head,
Department of Library and Information Science, Bharathidasan University,
Tiruchirappalli-620 024, India
Jawaharlal Nehru University, New Delhi, 110 067, India
Department of Library and Information Science, Bharathidasan University,
Tiruchirappalli-620 024, India

ABSTRACT

The paper examines 2539 Indian publications on Covid-19 Therapy and Treatment, as covered in Scopus database during 2019-May 2021. The top 10 most productive countries individually contributed global share of 33136, with USA accounting for the highest publication share with 8538, followed by China with 4558, Italy with 3707, United Kingdom with 3184, India with 2539, Spain with 1625, Germany with 1563, France with 1539, Canada with 1353 and Iran with 1212 Publications. India is ranked at 5th position in global Covid-19 Therapy and Treatment research output. USA topped the list with 309 share in India's international collaborative papers, followed by U.K. 161, Saudi Arabia 108, Australia 83, Italy 79 and China70, etc. The most productive Institutions are: All India Institute of Medical Sciences, New Delhi with 173 Publications, followed by Postgraduate Institute of Medical Education & Research, Chandigarh with 141, Datta Meghe Institute of Medical Sciences Deemed to be University with 71, Manipal Academy of Higher Education with 59. It is noted that 118 Institutions with more than 10 Publications, 5 Institutions with more than 50 Publications. The most preferred journals are: Journal Of Biomolecular Structure And Dynamics scored with 67 Publications, followed by Diabetes And Metabolic Syndrome Clinical Research And Reviews with 56, International Journal Of Current Research And Review with 42. The most leading authors are: Dhama, K. from Indian Veterinary Research Institute, Bareilly, India with 38 Publications followed by Tiwari, R. from College of Veterinary Science India, Tirupati, India with 23, Malik, Y.S. from Indian Veterinary Research Institute, Bareilly, India with 16, Javaid M from Jamia Millia Islamia, New Delhi, India and Medhi, B. from Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India and Vaishya, R. Indraprastha Apollo Hospitals, New Delhi, India with 15 respectively. Major portion of these publications appeared in foreign journals of repute, as reflected by their impact factors and Citescores. The study also indicates that Indian scientists have huge international collaboration in this field. Indian literature output peaked at about the same time as that of the world output.

Keywords: Covid-19 Therapy; Covid-19 Treatment; Scientometrics;

INTRODUCTION

Scientists are working to understand several coronavirus variants now circulating in India, where a ferocious second wave of COVID-19 has devastated

the nation and caught authorities unawares. The country recorded nearly 400,000 new infections on 9 May, taking its total to more than 22 million (see 'Surging cases of COVID-19'). Evidence is growing that one variant first detected in India might be more transmissible and slightly better at evading immunity than existing variants. Animal models also hint that it might be able to cause more severe disease. Researchers want to know if this variant and others might be driving the second wave and what kind of danger they pose globally. In few weeks, the B.1.617 variant has become the dominant strain across India and has spread to about 40 nations, including the United Kingdom, Fiji and Singapore. **(Nature: NEWS, 11 May 2021)**

Scientometrics is the quantitative study of science. It aims to analyze and evaluate science, technology, and innovation. Major research includes measuring the impact of authors, publications, journals, institutes, Citations, highly cited works and countries as referenced to sets of scientific publications such as articles and patents. Highly cited articles are very different from 'ordinary' cited articles. Typically, they are authored by a large number of scientists and Scholars, often involving international collaboration. Highly cited papers typically obtain citations from a large number of different sources and from papers representing both close by and faraway fields. The study examines Indian publications on Covid-19 Therapy and Treatment, as covered in Scopus database during 2019-May 2021.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

- To identify the geographical wise collaboration of Publications.
- To find out the most productive Institutions;
- To find out the most productive authors;
- To find out the most preferred source titles;
- To find out the most supported sponsors;
- To identify the highly cited papers;
- To analysis the document wise publication distribution;

METHODOLOGY

Scopus is a large abstract and citation database of peer-reviewed literature database. It is owned by Elsevier. The following search strings are used for collecting the data (TITLE-ABS-KEY (Covid-19 Therapy or Covid-19 Treatment) AND (LIMIT-TO (Affiliation, India)). A total of 2539 publication were published during the period of study, out of total 33136 publication (World output), 1956 (26541 at global level) are from open access publication. These records along with full bibliographical details such as Title, Author, Year, Document Type, Geographical distributions, Source, etc. have been extracted from the Scopus database. The data was tabulated in MS Excel and tested by the scientometrics tools to achieve the objectives.

DATA ANALYSIS AND INTERPRETATIONS

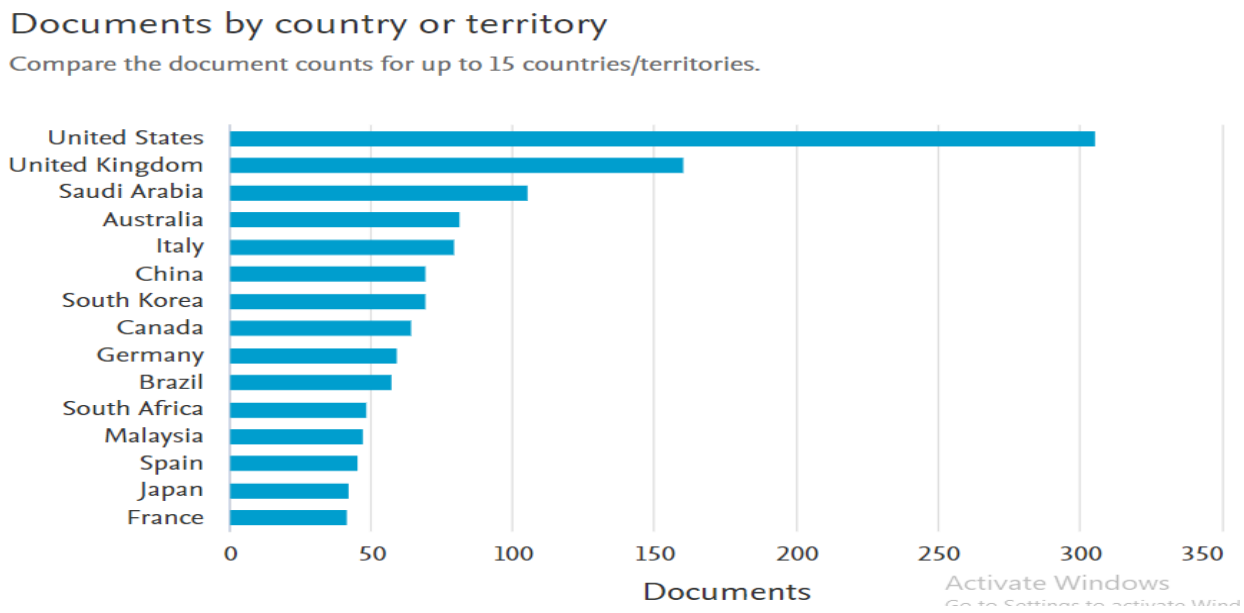
International Collaboration

International collaboration of Publications are presented in Table 1, which gives the country wise collaboration of research output. Out of 2539 research articles, USA leading collaboration with 305 (2769 Citations) followed by United Kingdom with 160, Saudi Arabia with 106 Publications. Other countries were found to be the next less than 100 publications, Australia with 81 Publications, Italy with 79 Publications and China and South Korea with 69 Publications respectively. Further, analysis of data indicates that less than 30% of the contribution is made by India compare with USA (8411), less than 60% compare with China (4515). It is noted than 3 countries with more than 100 publications, 10 countries with more than 50 publications and 55 countries with more than 10 publications.

Table 1: International Collaboration

Country	Publications	Country	Publications
United States	305	Indonesia	25
United Kingdom	160	Nigeria	24
Saudi Arabia	105	Sweden	24
Australia	81	Taiwan	24
Italy	79	Poland	22

China	69	Israel	21
South Korea	69	Belgium	17
Canada	64	Denmark	17
Germany	59	Mexico	17
Brazil	57	Russian Federation	17
South Africa	48	Argentina	16
Malaysia	47	Ireland	16
Spain	45	Portugal	16
Japan	42	Greece	15
France	41	Norway	15
Iran	40	Philippines	14
Singapore	39	New Zealand	13
Switzerland	39	Peru	13
Pakistan	37	Qatar	13
Thailand	36	Austria	12
Egypt	33	Finland	12
Bangladesh	32	Morocco	11
Turkey	31	Chile	10
Netherlands	30	Jordan	10
Colombia	27	Oman	10
Hong Kong	27	Romania	10
United Arab Emirates	27	Viet Nam	10
Nepal	26		



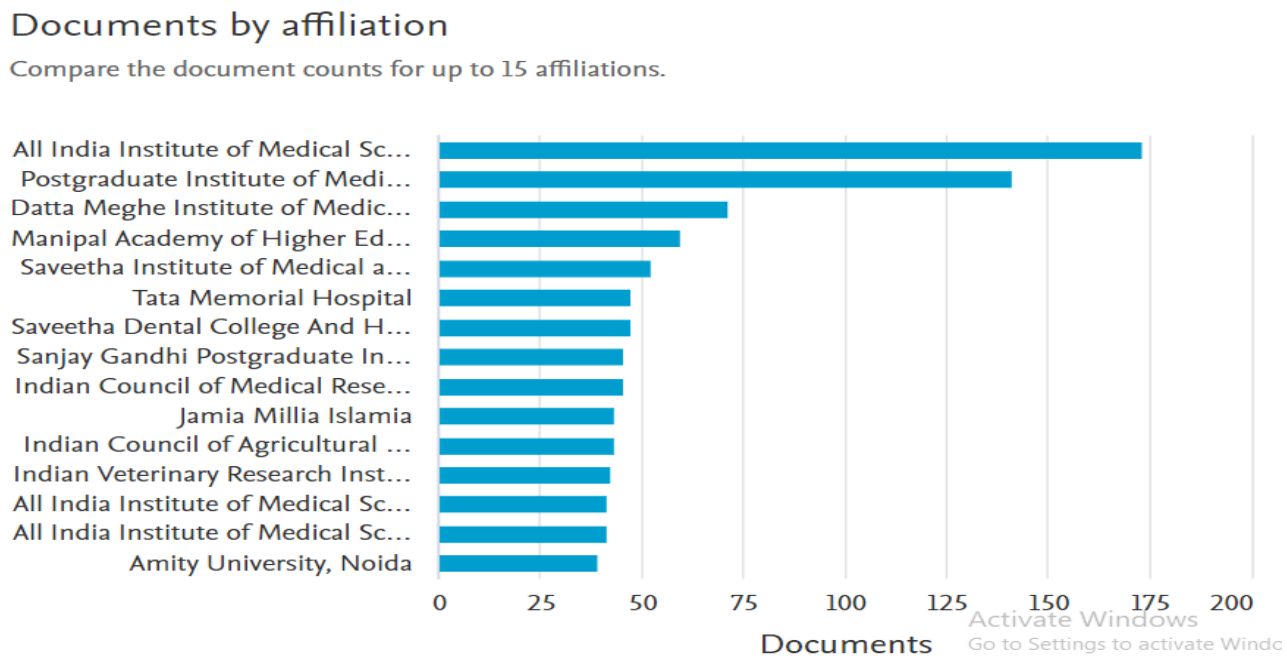
Most productive Institutions

The study found that the top research producer is All India Institute of Medical Sciences, New Delhi with 173 Publications followed by Postgraduate Institute of Medical Education & Research, Chandigarh with 141, Datta Meghe Institute of Medical Sciences Deemed to be University with 71, Manipal Academy of Higher Education with 59. It is noted that 118 Institutions with more than 10 Publications, 5 Institutions with more than 50 Publications.

Table 2: Most productive Institutions

Institution	Publications
All India Institute of Medical Sciences, New Delhi	173
Postgraduate Institute of Medical Education & Research, Chandigarh	141
Datta Meghe Institute of Medical Sciences Deemed to be University	71
Manipal Academy of Higher Education	59
Saveetha Institute of Medical and Technical Sciences	52
Tata Memorial Hospital	47
Saveetha Dental College And Hospitals	47
Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow	45
Indian Council of Medical Research	45
Jamia Millia Islamia	43
Indian Council of Agricultural Research	43
Indian Veterinary Research Institute	42
All India Institute of Medical Sciences, Jodhpur	41
All India Institute of Medical Sciences, Rishikesh	41
Amity University, Noida	39
Homi Bhabha National Institute	38
Mahatma Gandhi Ayurved College Hospital and Research Centre MGACH & RC	37
University of Delhi	36
King Saud University	35
VMMC & Safdarjang Hospital	33
Indraprastha Apollo Hospitals	31
King George's Medical University	30
National Institute of Mental Health and Neuro Sciences	28
Jawaharlal Nehru Medical College, Wardha	28
College of Veterinary Science India	27
Christian Medical College, Vellore	26
Vellore Institute of Technology	25
Kasturba Medical College, Manipal	22

Maharishi Markandeshwar Deemed to be University, Mullana	21
All India Institute of Medical Sciences, Patna	21
Dr. Ram Manohar Lohia Hospital	20
King Saud University College of Science	20
Jawaharlal Institute of Postgraduate Medical Education and Research	20
Indian Institute of Technology Delhi	20
U.P. Pandit Deen Dayal Upadhyaya pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan	20
Academy of Scientific and Innovative Research AcSIR	20



Document type

Table 3 illustrates the document wise distribution of publications on Covid-19 Therapy and Treatment during the study period. The maximum 1372 of publications were 'Article', followed by 'Review' with 737 publications and 229 of publications were 'Letter'.

Table 2: Document type wise distribution of Publications

Document type	Publications
Article	1372
Review	737
Letter	229
Note	61
Editorial	36
Conference Paper	31
Book Chapter	19

Short Survey	10
Erratum	1
Retracted	1

Most preferred Source titles

In Table 4, it is shown that the journal with the highest number of Publications occupies the highest rank and thus obviously the most important journal in the field of Covid-19 Therapy and treatment, while the least important titles are placed at the bottom of the table. The top 42 journals are arranged (with minimum of 10 publications) in order of their ranks. It can be ascertained that the International Journal of Research in Pharmaceutical Sciences occupies the first rank as the most preferred with 103 Publications, Journal of Biomolecular Structure And Dynamics scores the second highest with 67 Publications, followed by Diabetes and Metabolic Syndrome Clinical Research and Reviews with 56, International Journal of Current Research and Review with 42. The first ten journals in the rank list together accounts for near 20% of the total Publications. It is noted that 3 journals with more than 50 publications, 42 journals with more than 10 publications. Researchers are given preference to publish the papers in international publishers (country) such as UK, Netherland, USA, Romania, Switzerland, Italy and so on.

Table 4: Most preferred Source titles

Source title	Country	Publications
International Journal Of Research In Pharmaceutical Sciences	India	103
Journal Of Biomolecular Structure And Dynamics	UK	67
Diabetes And Metabolic Syndrome Clinical Research And Reviews	Netherland	56
International Journal Of Current Research And Review	India	42
Dermatologic Therapy	UK	30
Indian Pediatrics	India	29
Medical Hypotheses	US	26
Indian Journal Of Medical Research	India	24
Asian Journal Of Psychiatry	Netherland	23
European Journal Of Pharmacology	Netherland	19
Indian Journal Of Ophthalmology	India	18
Journal Of Medical Virology	USA	16
Science Of The Total Environment	Netherland	16

Human Vaccines And Immunotherapeutics	USA	15
Indian Journal Of Forensic Medicine And Toxicology	India	15
Journal Of Pure And Applied Microbiology	India	15
Virusdisease	India	15
Annals Of The Romanian Society For Cell Biology	Romania	14
BMJ Case Reports	UK	14
Frontiers In Pharmacology	Switzerland	14
International Journal Of Pharmaceutical Research	India	14
Life Sciences	USA	14
Frontiers In Molecular Biosciences	Switzerland	13
Indian Journal Of Anaesthesia	India	13
Indian Journal Of Clinical Biochemistry	India	13
Indian Journal Of Medical And Paediatric Oncology	India	13
Journal Of Anaesthesiology Clinical Pharmacology	India	13
Journal Of The Indian Medical Association	India	13
Lung India	India	13
Computers In Biology And Medicine	UK	12
Monaldi Archives For Chest Disease	Italy	12
Indian Journal Of Otolaryngology And Head And Neck Surgery	India	11
Archives Of Medical Research	USA	10
Biointerface Research In Applied Chemistry	Romania	10
Frontiers In Immunology	Switzerland	10
Frontiers In Public Health	Switzerland	10
Indian Journal Of Palliative Care	India	10
Indian Journal Of Pediatrics	India	10
Indian Journal Of Tuberculosis	India	10
Journal Of Ayurveda And Integrative Medicine	Netherland	10
Journal Of Surgical Oncology	USA	10
Phytotherapy Research	UK	10

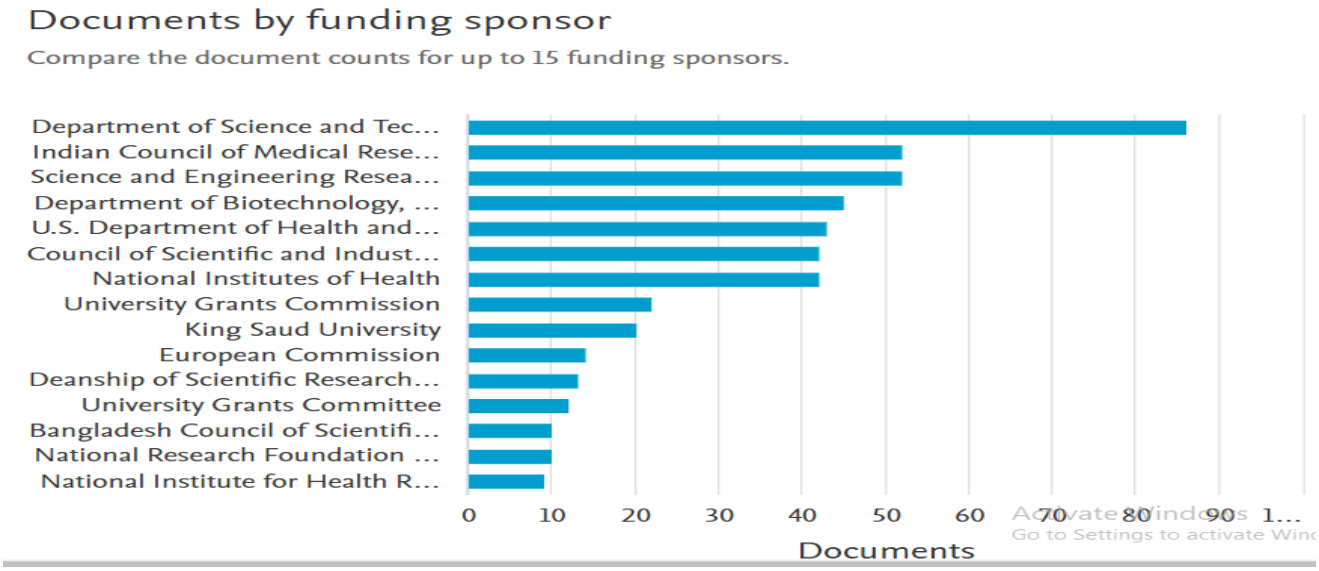
Funding Sponsors

Bibliometric/Scientometric methods have often been used to analyze publications supported by grant-funding agencies. In the Covid-19 Therapy and Treatment, the leading supported Sponsors are: Department of Science and Technology, Ministry of Science and Technology, India with 86 Publications followed by Indian Council of Medical Research and Science and Engineering Research Board with 52 respectively. More over Indian researcher received the fund from International funding agencies such as U.S. Department of Health and

Human Services, WHO, King Saud University, European Commission, National Research Foundation of Korea etc.,

Table 5: Funding Sponsors

Funding Sponsor	Publications
Department of Science and Technology, Ministry of Science and Technology, India	86
Indian Council of Medical Research	52
Science and Engineering Research Board	52
Department of Biotechnology, Ministry of Science and Technology, India	45
U.S. Department of Health and Human Services	43
Council of Scientific and Industrial Research, India	42
National Institutes of Health	42
University Grants Commission	34
King Saud University	20
European Commission	14
Deanship of Scientific Research, King Saud University	13
Bangladesh Council of Scientific and Industrial Research	10
National Research Foundation of Korea	10
National Institute for Health Research	9
University of Delhi	9
All-India Institute of Medical Sciences	8
Department of Biotechnology, Government of West Bengal	8
Ministry of Human Resource Development	8
Sanofi	8
World Health Organization	8



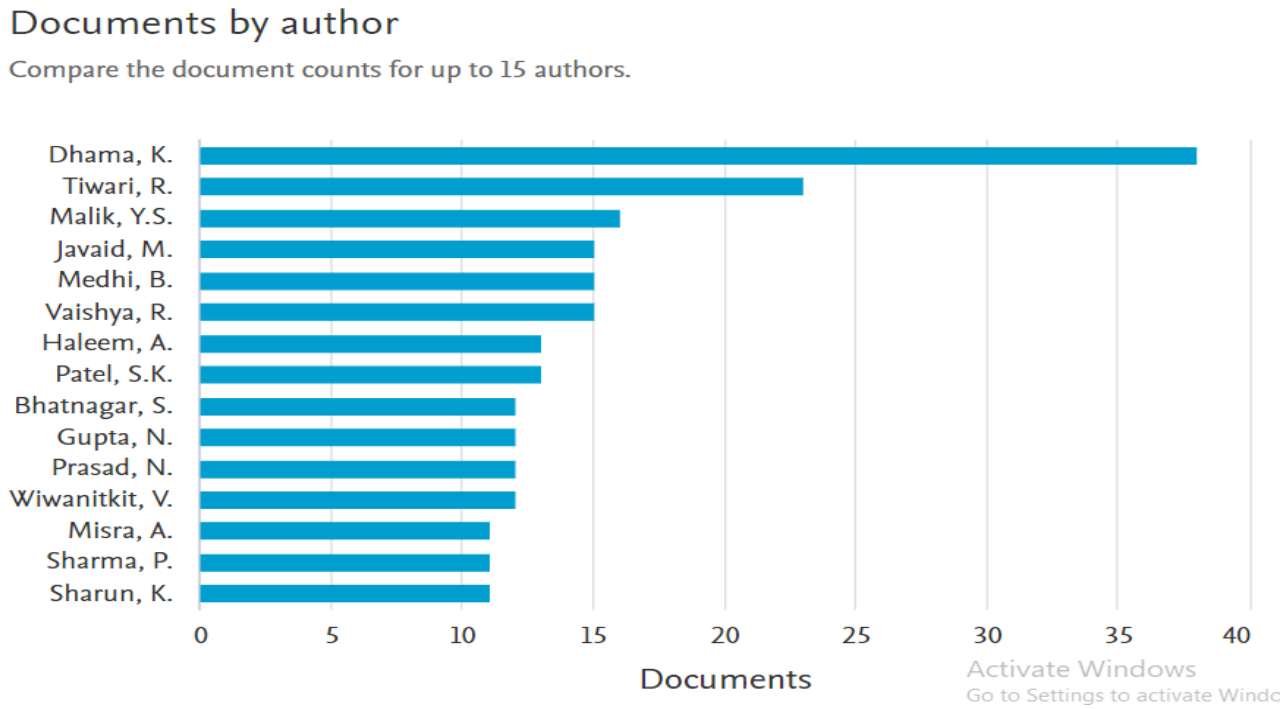
Most productive Authors

Table 6 shows the research productivity of authors in Covid-19 Therapy and Treatment research. The most productive and leading authors are: Dhama, K. from Indian Veterinary Research Institute, Bareilly, India with 38 Publications followed by Tiwari, R. from College of Veterinary Science India, Tirupati, India with 23, Malik, Y.S. from Indian Veterinary Research Institute, Bareilly, India with 16, Javaid M from Jamia Millia Islamia, New Delhi, India and Medhi, B. from Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India and Vaishya, R. Indraprastha Apollo Hospitals, New Delhi, India with 15 respectively. It is noted that 21 authors with more than 10 Publications.

Table 6: Most productive Authors

Author	Institution	Publications
Dhama, K.	Indian Veterinary Research Institute, Bareilly, India	38
Tiwari, R.	College of Veterinary Science India, Tirupati, India	23
Malik, Y.S.	Indian Veterinary Research Institute, Bareilly, India	16
Javaid, M.	Jamia Millia Islamia, New Delhi, India	15
Medhi, B.	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	15
Vaishya, R.	Indraprastha Apollo Hospitals, New Delhi, India	15
Haleem, A.	Jamia Millia Islamia, New Delhi, India	13
Patel, S.K.	Indian Veterinary Research Institute, Bareilly, India	13
Bhatnagar, S.	National Cancer Institute, Jhajjar, India	12
Gupta, N.	VMMC & Safdarjang Hospital, New Delhi, India	12
Prasad, N.	Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow, Lucknow, India	12
Wiwanitkit, V.	Dr. D. Y. Patil Medical College, Hospital & Research Centre, Dr. D. Y. Patil Vidyapeeth, Pune, Pune,	12
Misra, A.	Fortis C-DOC Center of Excellence for Diabetes, New Delhi, India	11
Sharma, P.	All India Institute of Medical Sciences, Jodhpur, Jodhpur, India	11
Sharun, K.	Indian Veterinary Research Institute, Bareilly, India	11
Harapan, H.	Universitas Syiah Kuala, Banda Aceh, Indonesia	10
Ish, P.	VMMC & Safdarjang Hospital, New Delhi, India	10
Misra, S.	All India Institute of Medical Sciences, Jodhpur, Jodhpur, India	10
Pal, R.	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	10

Rodriguez-Morales, A.J.	Indian Veterinary Research Institute, Bareilly, India	10
Sah, R.	Indian Veterinary Research Institute, Bareilly, India	10
Agarwal, S.	All India Institute of Medical Sciences, New Delhi, New Delhi, India	9
Bhattacharya, M.	Fakir Mohan University, Balasore, India	9
Kumar, M.	Indian Institute of Technology Gandhinagar, Gandhinagar, India	9
Sarma, P.	Postgraduate Institute of Medical Education & Research, Chandigarh, Chandigarh, India	9
Singh, A.K.	G.D Hospital & Diabetes Institute, Kolkata, India	9



Highly Cited papers

Table 7 shows the progressive distribution of highly cited articles. There were only 23 highly cited articles with more than 100 Citations related to Covid-19 Therapy and Treatment. The most cited papers are: Singhal, T. (2020), from Department of Pediatrics and Infectious Disease, Kokilaben Dhirubhai Ambani Hospital and Medical Research Institute, Mumbai, India entitled on "A Review of Coronavirus Disease-2019 (COVID-19)" (Review)(Open Access), Indian Journal of Pediatrics, Volume 87, Issue 4, 1 April 2020, Pages 281-286 with 788 Citations followed by Phua, J.a,bEmail Author, Weng, L.c, Ling, L.d, Egi, M.e, Lim, C.-M.f, **Divatia, J.V.g**, Shrestha, B.R.h, Arabi, Y.M.i, Ng, J.j, Gomersall, C.D.d, Nishimura, M.k, Koh, Y.f, Du, B.c, (2020) from Department of Anaesthesia,

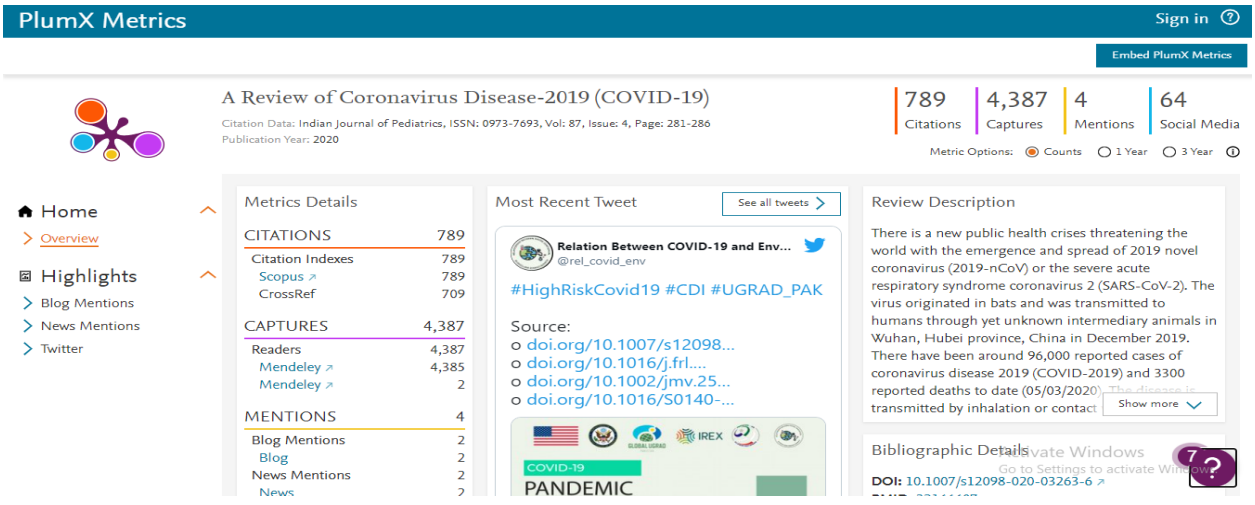
Critical Care and Pain, Tata Memorial Hospital, Homi Bhabha National Institute, Mumbai, India entitled on Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations(Review)(Open Access), The Lancet Respiratory Medicine, Volume 8, Issue 5, May 2020, Pages 506-517 with 433 Citations.

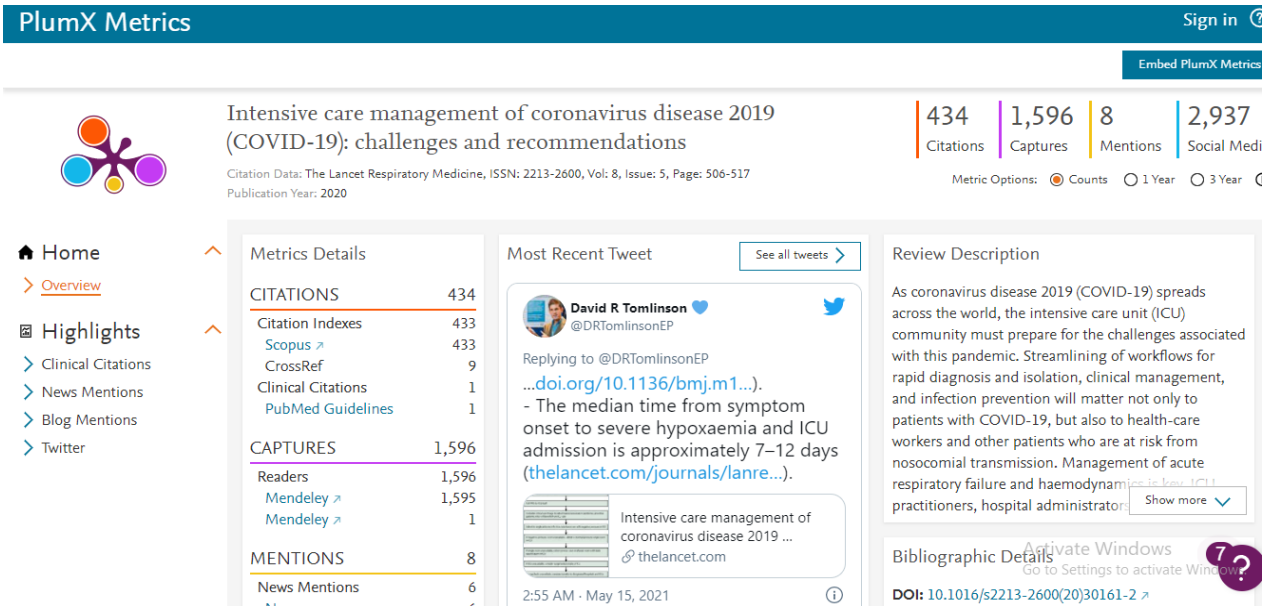
It is noted that top 200 articles registered 10544 Citations and shows development of global research interest and increased popularity among Doctors, researchers and scientists. Our results are consistent with other previous observations that the Covid-19 Therapy and Treatment concept has increasingly gained attention at the global level while becoming a top research area in Medical fields during this covid-19 pandemic situation. The below figures shows the plumX Metrics for Highly Cited papers.

Table 7: Highly cited papers

	Documents	**Citations**	**2020**	**2021**	**Total**
Total			5588	4956	10544
A Review of Coronavirus Disease-2019 (COVID-19)	2020	488	300	788	788
Intensive care management of coronavirus disease 2019 (COVID...	2020	291	142	433	433
Transplantation of ACE2^{-} Mesenchymal stem cells i...	2020	240	137	377	377
Autoantibodies against type I IFNs in patients with life-thr...	2020	41	224	265	265
Cardiovascular disease and COVID-19	2020	129	82	211	211
COVID-19 and diabetes: Knowledge in progress	2020	134	63	197	197
COVID-19, an emerging coronavirus infection: advances and pr...	2020	125	55	180	180
Chloroquine and hydroxychloroquine in the treatment of COVID...	2020	133	46	179	179
COVID-19 and Older Adults: What We Know	2020	96	82	178	178
COVID-19: A promising cure for the global panic	2020	112	64	176	176
Repurposed antiviral drugs for COVID-19 — InteriM WHO solida...	2021	10	147	157	157
Novel 2019 coronavirus structure, mechanism of action, antiv...	2020	118	39	157	157
Diabetes in COVID-19: Prevalence, pathophysiology, prognosis...	2020	95	56	151	151
Coronavirus disease 2019–COVID-19	2020	77	68	145	145
SARS-CoV-2, SARS-CoV, and MERS-CoV: A comparative overview	2020	81	54	135	135

Convalescent plasma transfusion for the treatment of COVID-1...	2020	69	57	126	126
Gut microbiota and Covid-19- possible link and implications	2020	62	61	123	123
Are high-performing health systems resilient against the COV...	2020	77	46	123	123
Convalescent plasma in the management of moderate covid-19 i...	2020	10	102	112	112
Andrographolide as a potential inhibitor of SARS-CoV-2 main ...	2020	75	32	107	107
Rheumatologists' perspective on coronavirus disease 19 (COVI...	2020	71	32	103	103
Emergency tracheal intubation in 202 patients with COVID-19 ...	2020	74	29	103	103
Identification of bioactive molecules from tea plant as SARS...	2020	54	48	102	102





SUMMARY AND CONCLUSION

India published 2539 (33136 Global Research output) publications in Covid-19 Therapy and Treatment research during 2019-2021, as reflected in Scopus database. Its annual publications increased from 2(10 at global) in the year 2019 to 1602 (20831) publications in the year 2020 and till may with (935)12294. India was ranked at 5th position in global Covid-19 Therapy and Treatment research output. USA topped the list with 309 share in India's international collaborative papers, followed by U.K. 161, Saudi Arabia 108, Australia 83, Italy 79 and China70 etc., 1956 papers are published in open access Journals such as Gold 684), Hybrid Gold (88), Bronze (953) and Green (1170). The majority of the articles were contributed by joint authors. Top 200 publications indexed which were having a total number of 10544 citations.

The publishing trend totally depends on the output of contributors, patterns of contributions and the quality of research. This study reveals that the categories of article distributions are remarkable in this research areas. As scientists edge closer to creating a vaccine against the SARS-CoV-2 coronavirus, Indian pharmaceutical companies are front and centre in the race to supply the world with an effective product. But researchers worry that, even with India's experience as a vaccine manufacturer, its companies will struggle to produce enough doses sufficiently fast to bring its own huge outbreak under control. On top of that, it will be an immense logistical challenge to distribute the doses to people in rural and remote regions. Indian drug companies are major manufacturers of vaccines distributed worldwide, particularly those for low-income countries, supplying more than 60% of vaccines supplied to the developing world. **(Nature: News, 03 September 2020)**

REFERENCES

- **Kumar, P. A., Manoranjitham, R., & Sivasekaran, D. K. (2020).** Mapping of microbial technology research output at the global level: A scientometric study. *Library Philosophy and Practice, 2020*, 1-18.

- **Rajagopal, T., Archunan, G., Surulinathi, M., & Ponmanickam, P. (2013).** Research output in pheromone biology: A case study of india. *Scientometrics, 94*(2), 711-719. doi:10.1007/s11192-012-0788-4
- **Laksham S., Surulinathi M., Balasubramani, R. and Srinivasaragavan S. (2020).** Mapping the research output on Coronavirus: A Scientometric Study, Gedrag & Organisatie Review, 33(2), 163-186.
- **Sebastiyan, R., Babu, V. R., & Surulinathi, M. (2020).** Mapping of research output in food economics: A scientometric ananlysis. *Library Philosophy and Practice, 2020*, Summer 9-1-2020, 1-18.
- **Senthamilselvi, A., Surulinathi, M., Karthik, M., & Jayasuriya, T. (2020).** Research output on coronavirus (covid-19)/Hantavirus in india: A scientometric study. *Library Philosophy and Practice, 2020*, , Winter 11-2-2020, 1-34.
- **Surulinathi, M., Arputha Sahayarani, Y., Srinivasa Ragavan, S., Rajkumar, N., & Jayasuriya, T. (2021).** Covid-19 drugs and medicines: A scientometric mapping of research publications. *Library Philosophy and Practice, 2021*, 1-16.
- **Surulinathi, M., Balasubramani, R., & Amsaveni, N. (2020).** Covid-19 research output in 2020: The global perspective using scientometric study. *Library Philosophy and Practice, 2020*, *2020*, 1-18.
- **Surulinathi, M., Jayasuriya, T., Duraipandi, R., & Senthamilselvi, A. (2021).** A scientometric analysis of highly cited works on herbal drugs, medicines and vaccines. *Library Philosophy and Practice, 2021*, 1-17.
- **Surulinathi, M., Rajkumar, N., Jayasuriya, T., & Rajagopal, T. (2021).** Indian contribution in animal behaviour research: A scientometric study. *Library Philosophy and Practice, 2021*, 1-19.
- **Surulinathi, M., Sankaralingam, R., Senthamilselvi, A., & Jayasuriya, T. (2020).** Highly cited works in covid-19: The global perspective. *Library Philosophy and Practice, 2020*, 1-18.
- https://www.nature.com/articles/d41586-021-01274-7