

Current And Future Perspectives On The Covid-19 Drugs, Vaccine And Medicine: A Scientometric Assessment Of Publications

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Abstract

Coronavirus disease 2019 (COVID-19) caused by the novel coronavirus SARS-CoV-2 that was declared as a pandemic has been the main subject of research all over the world. Especially studies on COVID-19 vaccines, Medicine and Drugs has become a hope for everyone. In this study, we aimed to analyses entire literature through Web of Science© Core Collection Database and reveal the current status of COVID-19 vaccine/Medicine/Drugs literature. A total of 3169 publications with 40126 citations times were involved into the study. The most active Institutions Are All India Institute of Medical Sciences, New Delhi with 177 publications (TC=2244), followed by University of Delhi with 79(TC=1185), IIT with 74(TC=880), ICAR Indian Vet Res Institute with 64(TC=5539) and Postgrad Institute Med Education & Res with 60 (1105 Citations). Majority of the publications were original articles. Biochemistry Molecular Biology, Pharmacology Pharmacy, Immunology, Biophysics, Medicine Research Experimental, Chemistry Multidisciplinary, Infectious Diseases. Majority of the publications were written in English. most productive journals were JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS (252), HUMAN VACCINES & IMMUNOTHERAPEUTICS (55), COMPUTERS IN BIOLOGY AND MEDICINE (45), FRONTIERS IN PHARMACOLOGY (40) and JOURNAL OF MOLECULAR STRUCTURE (36). The United States of America was the most

productive country followed by China and India. Research in vaccines is a growing field and is an essential component in the fight against COVID-19. Detailed analyses on vaccine publications may help researchers determine the future perspective.

Key words: Covid-19 Vaccine, Covid-19 Drugs, Covid-19 Medicine, Scientometrics.

INTRODUCTION

The rapid spread of COVID-19 and the proliferation of patients around the world, as well as the change in new mutations and the lack of definitive treatment for it, the issue of vaccine and individual vaccination has become a priority of governments as the only way to control the disease. Therefore, scientists believe that safety and control of this disease are achieved when 60 to 70% of the world's population is vaccinated against this disease. The present study helps to identify important interdisciplinary topics and research areas resulting from scientific publications, the most prolific and influential researchers, institutions, countries, and journals that publish new research on coronavirus vaccines and develops a plan for future research collaborations. The importance of using vaccines in the prevention and control of pandemics and following an increase of scientific publications on the COVID-19 vaccine, attention to scientometric studies to assess the research productivity and collaborations of various disciplines, researchers, and institutions of the world in this field have gained a special importance. Therefore, the current research aims to draw the present and future perspective of the COVID-19 vaccine studies by identifying the most important actors and their scientific fields, trends in research topics, and relationships between different entities.

AIMS AND OBJECTIVES

The main objective of this study was to analyse the research performance of India in Covid-19 Drugs, Medicine and Vaccine research in national and global context, as reflected in its publication output during 2020-2022. In particular, the study focuses on the following objectives:

- To study the Indian research output, its growth, rank and global publication share and impact.
- To study the patterns of international collaboration.
- To study the publication productivity and impact of leading Indian institutions and authors.
- To study the most preferred journals
- To study the characteristics of Indian highly cited papers.

METHODOLOGY

Publications as listed in the Web of Science database (<http://isiknowledge.com>), with at least one author from India and addressing the issues of 'Covid-19 Drugs, Medicine and Vaccine'

were identified, retrieved and downloaded using a well-defined search strategy. The search strategy on diabetes literature was carried out using the following keywords suggested by BM Gupta TS=(("COVID 19" OR "2019 novel coronavirus" OR "coronavirus 2019" OR "coronavirus disease 2019" OR "2019-novel CoV" OR "2019 ncov" OR Covid 2019 OR covid19 OR "corona virus 2019" OR ncov-2019 OR ncovid19 OR "nCoV 2019" OR 2019-ncov OR covid-19 OR "Severe acute respiratory syndrome coronavirus 2" OR "SARS-CoV-2") OR KEY ("COVID 19" OR "2019 novel coronavirus" OR "coronavirus 2019" OR "coronavirus disease 2019" OR "2019-novel CoV" OR "2019 ncov" OR Covid 2019 OR covid19 OR "corona virus 2019" OR ncov-2019 OR ncovid19 OR "nCoV 2019" OR 2019-ncov OR covid-19 OR "Severe acute respiratory syndrome coronavirus 2" OR "SARS-CoV-2")) AND TS=(DRUGS OR MEDICINE OR VACCINE), which combines India's collaboration with 140 major countries was prepared. The study used metrics and indicators to quantify and evaluate the performance of the most productive organizations, authors and journals. To evaluate and visualize the collaborative interaction among most productive countries, organizations, authors and keywords, Histcite, VOSviewer and Biblioshiny app for Bibliometrix were used.

RESULTS

Top 25 Countries

The global output on Covid Drugs, Medicine and Vaccine comprised of 40,348 publications. Among these publications, majority of the publications emerged from top 25 countries, which were cited 849382 times. Publication Rank and Share of Most Productive Countries in overall, the global publication share (Table 1) of the top 25 countries vary from 1.36 per cent to 3085 per cent during the study period. United States topped the list with global publication share of 30.85 (TP:12304; TC=241628; H-Index=195) per cent. Peoples R China ranked second (TP:4744; TC=119598; H-Index=152) followed by England, Italy, India, Germany, Canada, Australia, France and Spain (with global publication share ranging from 3.81per cent to 9.03 per cent). Indian ranked at 5th positions with global publication share of 3201 publications and received 40132 Citations (H-Index=74).

Table1: Top 25 Countries

S.No	Countries/Regions	TP	TC	ACPP	H-Index	%
1	USA	12304	241628	19.64	195	30.853
2	PEOPLES R CHINA	4744	119598	25.21	152	11.896
3	ENGLAND	3600	86134	23.93	123	9.027
4	ITALY	3503	5262	14.96	90	8.784
5	INDIA	3201	40132	12.54	74	8.027
6	GERMANY	2214	48149	21.75	96	5.552

7	CANADA	1833	34487	18.81	76	4.596
8	AUSTRALIA	1583	28524	18.02	67	3.969
9	FRANCE	1555	32754	21.06	74	3.899
10	SPAIN	1519	20023	13.08	57	3.809
11	SAUDI ARABIA	1204	13355	11.09	45	3.019
12	BRAZIL	1126	21053	18.7	54	2.823
13	IRAN	1035	10874	10.51	47	2.595
14	TURKEY	1006	13783	13.7	43	2.523
15	JAPAN	939	7919	8.43	39	2.355
16	SWITZERLAND	917	19709	21.49	60	2.299
17	SOUTH KOREA	884	10720	12.13	45	2.217
18	NETHERLANDS	865	20930	24.2	61	2.169
19	EGYPT	762	7885	10.35	38	1.911
20	ISRAEL	695	14149	20.36	59	1.743
21	BELGIUM	637	11964	18.78	50	1.597
22	POLAND	628	6139	9.78	40	1.575
23	SOUTH AFRICA	620	18833	30.38	48	1.555
24	PAKISTAN	600	6236	10.39	35	1.505
25	SWEDEN	546	9142	16.74	45	1.369

Publications from India

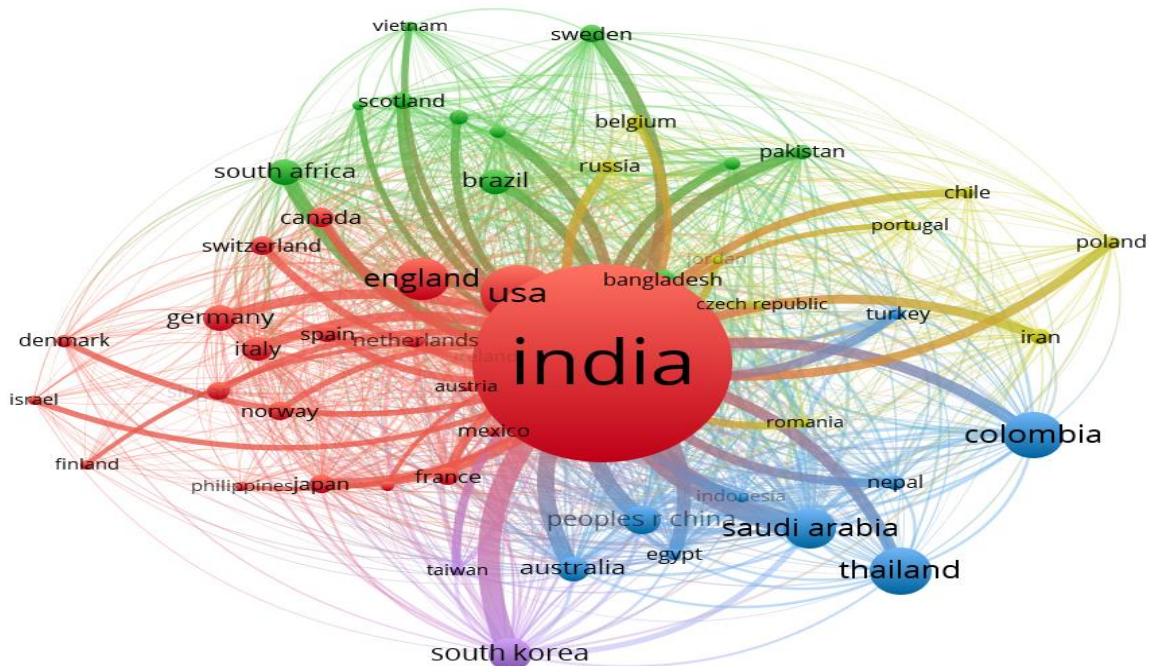
Of the 40348 global publications, only 3169 publications had one author from India. These publications received 40126 citations, averaging 12.66 CPP. The major funding agencies supporting India's research on Covid-19 Drugs, Medicine and Vaccine Were Department of Science and Technology (186 publications), CSIR (132), Department of Biotechnology, India (128), ICMR (127) and UGC 96). In all, there were 138 countries involved in research in Covid-19 Drugs, Vaccine and Medicine field and which published at least one publication collaboration with India. The USA topped the list with highest share (TP=476; TC=6374) of publications followed by Saudi Arabia with 310 (TC=3745) share of publication, United Kingdom with 251 share of publications (TC=2739) followed by Australia with 138 and China 135 share of publications. The study found that 8 countries recorded more than 100 Publications and 67 countries with minimum of 10 Publications.

Table 2: Publications from India

#	Country	TP	TC	ACPP	#	Country	TP	TC	ACPP
1	USA	476	6374	13.49		Canada	83	1287	15.41

2	Saudi Arabia	310	3745	12.17	Malaysia	80	592	7.7
3	UK	251	4619	18.75	Bangladesh	72	1061	14.68
4	South Korea	161	2739	17.09	Japan	72	1097	15.49
5	Australia	138	1743	12.72	Egypt	66	538	8.21
6	Peoples R China	135	2234	16.32	Switzerland	65	1194	18.8
7	Germany	102	1926	18.88	Pakistan	64	813	12.62
8	Italy	102	1642	16.38	Spain	63	1060	16.89
9	South Africa	96	1841	19.36	Sweden	61	1004	16.57
10	Brazil	83	1770	21.65	Turkey	61	513	8.45

Note: TP=Total Publications; TC=Total Citations; ACP=Average Citation Per Paper



Citation Network of Indian Publications (International Collaborations)

Profile of Top 30 Journals

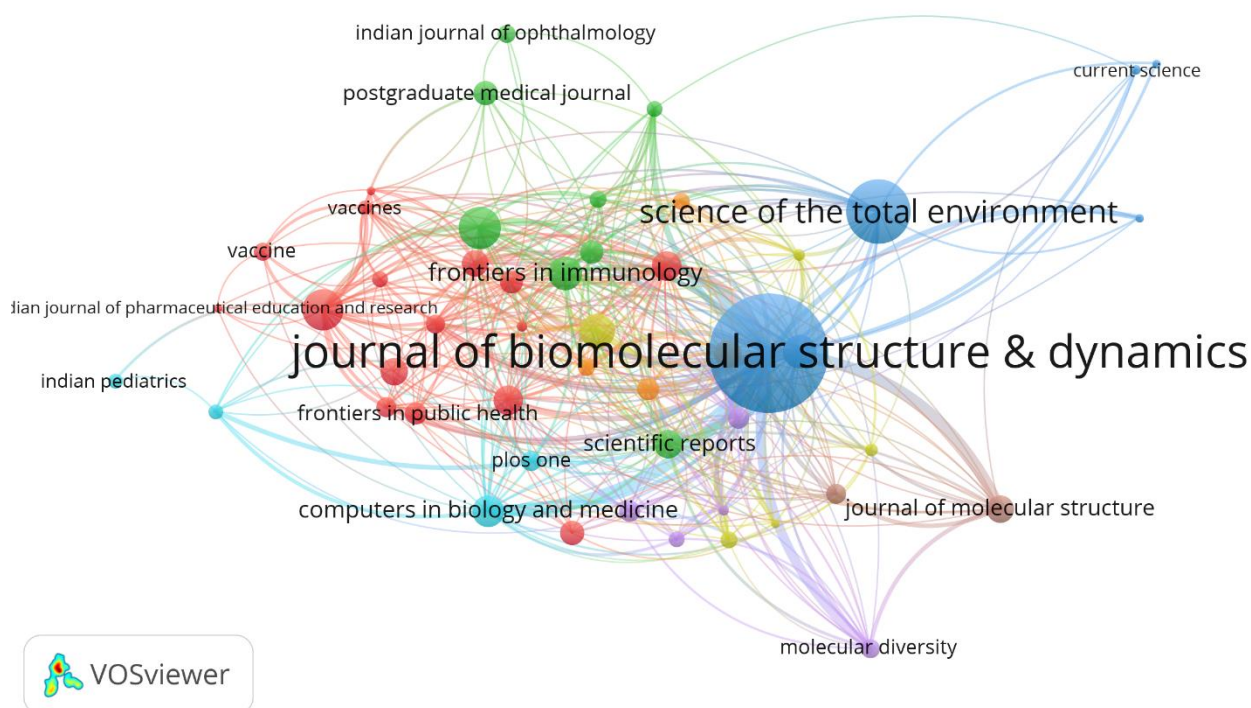
The publications with one author from India, in the area of Covid-19 Drugs, Medicine and Vaccine were published across 936 journals. Among 936 journals, 818 journals published 1-5 papers each, 66 journals 10-50 papers each, 2 journals 55 and 255 papers respectively. The top 30 journals contributed 17 to 252 publications each and together published 988 papers, that were cited 13678 times. Among these, only 3 journals publishers from India 61 share of publications. On further analysis it was found that: (i) the top 5 most productive journals were JOURNAL OF

BIOMOLECULAR STRUCTURE & DYNAMICS (252), HUMAN VACCINES & IMMUNOTHERAPEUTICS (55), COMPUTERS IN BIOLOGY AND MEDICINE (45), FRONTIERS IN PHARMACOLOGY (40) and JOURNAL OF MOLECULAR STRUCTURE (36). (Table:3)

Table 3: Most preferred Journals

#	Journal	Country	IF	TP	TC
1	JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS	Philadelphia	3.392	252	4502
2	HUMAN VACCINES & IMMUNOTHERAPEUTICS	Philadelphia	3.452	55	688
3	COMPUTERS IN BIOLOGY AND MEDICINE	England	4.589	45	429
4	FRONTIERS IN PHARMACOLOGY	Switzerland	4.400	40	379
5	JOURNAL OF MOLECULAR STRUCTURE	Netherlands	3.196	36	336
6	JOURNAL OF MEDICAL VIROLOGY	Hoboken	2.327	33	719
7	FRONTIERS IN IMMUNOLOGY	Switzerland	6.429	30	493
8	EUROPEAN JOURNAL OF PHARMACOLOGY	Netherlands	4.432	26	520
9	MOLECULAR DIVERSITY	Netherlands	2.943	26	172
10	SCIENTIFIC REPORTS	Germany	4.38	26	365
11	VACCINE	England	3.641	26	158
12	INDIAN JOURNAL OF MEDICAL RESEARCH	India	1.503	25	384
13	JOURNAL OF INFECTION AND PUBLIC HEALTH	England	3.718	25	244
14	MEDICAL HYPOTHESES	Scotland	1.538	24	263
15	VACCINES	Switzerland	3.641	24	103
16	RSC ADVANCES	England	3.36	23	217
17	CURRENT PHARMACEUTICAL DESIGN	Arab Emirates	2.208	22	89
18	SAUDI JOURNAL OF BIOLOGICAL SCIENCES	Netherlands	4.219	22	124
19	FRONTIERS IN MOLECULAR BIOSCIENCES	Switzerland	4.615	21	193
20	SCIENCE OF THE TOTAL ENVIRONMENT	Netherlands	7.963	21	1518
21	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	Germany	4.233	20	79
22	INFECTION GENETICS AND EVOLUTION	Netherlands	3.342	20	260
23	INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES	Netherlands	6.953	20	225
24	HELIYON	England	2.85	19	142

25	INDIAN JOURNAL OF PHARMACEUTICAL EDUCATION AND RESEARCH	India	0.501	19	15
26	FRONTIERS IN MICROBIOLOGY	Switzerland	5.64	18	209
27	FRONTIERS IN PUBLIC HEALTH	Switzerland	3.018	18	223
28	LIFE SCIENCES	England	5.037	18	474
29	INDIAN JOURNAL OF TRADITIONAL KNOWLEDGE	India	0.757	17	11
30	INTERNATIONAL IMMUNOPHARMACOLOGY	Netherlands	4.932	17	144



Citation Network of Sources

Most Active Authors

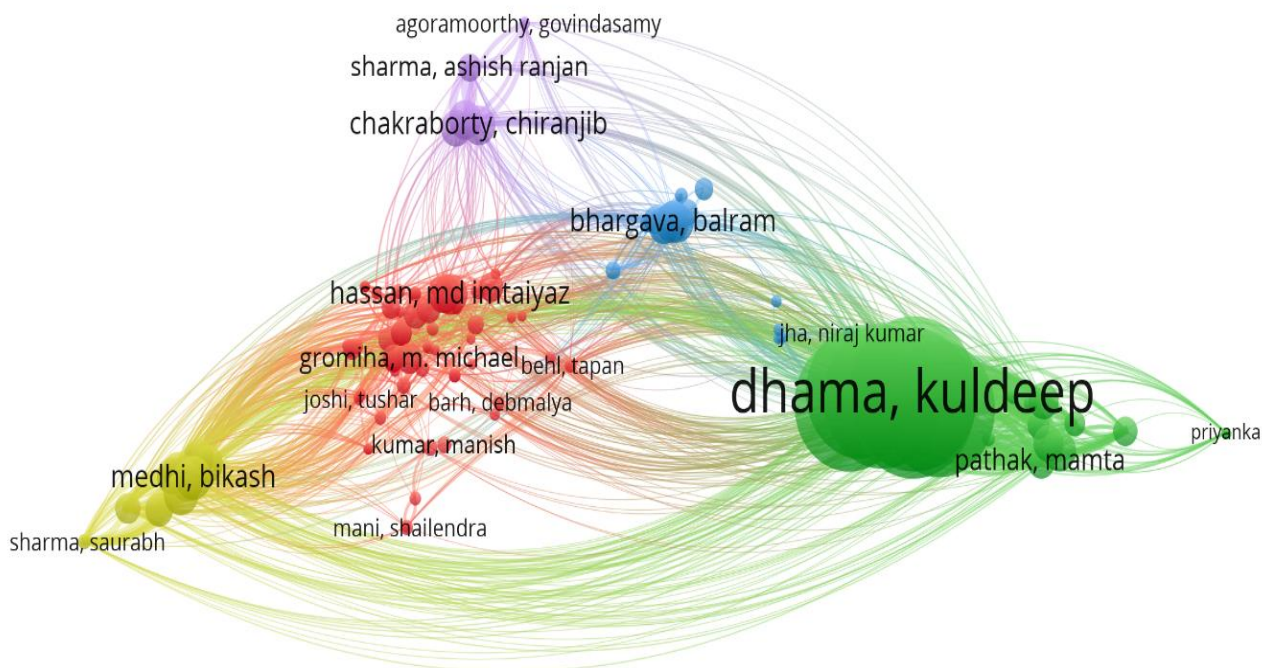
Profile of Top 25 Authors All the publications from India and 25 authors individually contributed to 27-123 papers each and together contributed to 1156 publications. Only 6 authors had more than 50 papers and 11 authors received more than 1000 Citations. The most top 5 authors are: Kumar S from Sardar Swaran Singh Natl Inst Bioenergy, Biochem Convers Div, Jalandhar Kapurthala Rd, Kapurthala 144601, Punjab, India with 123 (TC=1891) followed by Kumar A (TP=89; TC=798), Dharma K (TP=69; TC=5468) Singh (TP=61; TC=857) and Sharma S (TP=53; TC=645). The most cited authors are: Dharma from ICAR Indian Vet Res Inst, DivPathol, Bareilly 243122, Uttar Pradesh, India with 5465(ACPP=79.2) citations followed by Tiwari from Uttar

Pradesh PanditDeenDayalUpadhyayaPashuCh, Coll Vet Sci, Dept Vet Microbiol&Immunol, Mathura, India with 5199 Citations (ACPP=126.80), Malik from ICAR Indian Vet Res Inst, DivBiolStandardizat, Bareilly, Uttar Pradesh, India. with 4950 Citations (ACPP=235.71).

Table 4: The most active Authors

#	Author	Affiliation	TP	TC	ACPP
1	Kumar S	Sardar Swaran Singh Natl Inst Bioenergy, Biochem Convers Div, Jalandhar Kapurthala Rd, Kapurthala 144601, Punjab, India	123	1891	14.74
2	Kumar A	Assam Univ, Dept Life Sci&Bioinformat, Silchar, India	89	798	8.53
3	Dhama K	ICAR Indian Vet Res Inst, DivPathol, Bareilly 243122, Uttar Pradesh, India	69	5465	79.2
4	Singh S	Chandigarh Univ, Univ Inst Pharma Sci, Dept Pharm, Gharuan, Mohali, India	61	857	14.23
5	Sharma S	Bennett Univ, SchEngn&ApplSci, Dept Biotechnol, Greater Noida 201310, Uttar Pradesh, India	53	645	11.55
6	Singh R	Cent Univ Rajasthan, Sch Earth Sci, Dept EnvironmSci, NH8, Ajmer 305817, Rajasthan, India	52	890	16.42
7	Kumar R	Amity Univ Uttar Pradesh, Amity InstBiotechnol, Lucknow Campus, Lucknow, Uttar Pradesh, India	49	522	10.51
8	Kumar V	Jadavpur Univ, Dept PharmaceutTechnol, Drug Theoret&Cheminformat Lab, Kolkata, India	49	446	9.1
9	Kumar P	Delhi Technol Univ, Dept MechEngn, Delhi, India	48	586	11.72
10	Singh A	PDPM Indian InstInformatTechnol Design &Mfg, Jabalpur 482005, India	45	639	13.75
11	Sharma P	VardhmanMahavir Med Coll, Dept Community Med, New Delhi, India	42	444	9.84
12	Tiwari R	DeenDayalUpadhayayPashuChikitsaVigyanVishwa, Dept Vet Microbiol&Immunol, Coll Vet Sci, Mathura, India	41	5199	126.8
13	Das S	Jawaharlal Inst Postgrad Med Educ& Res, Dept ClinPharmacol, Pondicherry 605006, India	40	828	21.51
14	Kumar M	All India Inst Med Sci, Dept Biophys, New Delhi, India	40	330	8.25
15	Singh P	ICAR Natl Inst High SecurAnim Dis, Bhopal, India	38	476	12.86
16	Wiwanitkit V	Private Acad Consultant, Jaipur, Rajasthan, India	38	77	1.71

17	Prakash A	Banaras Hindu Univ BHU, Dept Zool, Varanasi, Uttar Pradesh, India	35	531	14.78
18	Gupta N	Indian Council Med Res, New Delhi 110029, India	34	702	20.06
19	Kumar D	ISF Coll Pharm, Dept PharmaceutChem, GT Rd, Moga 142001, Punjab, India	34	415	12.55
20	Sharma N	Natl Inst Plant Genome Res, ArunaAsaf Ali Marg, New Delhi 110067, India	33	191	5.79
21	Ghosh A	Natl InstPharmaceutEduc& Res Kolkata, Dept Nat Prod, Kolkata, India	32	250	7.79
22	Gupta A	Univ Delhi, Sri VenkateswaraColl, Dept Chem, Delhi, India	28	267	9.43
23	Medhi B	All India Inst Med Sci, Dept Biochem, Rishikesh, India	28	591	20.41
24	Sharma AR	Post Grad Inst Med Educ& Res PGIMER, Chandigarh, India	28	710	25.36
25	Gupta S	Indian Inst Management, InformatSyst Dept, 63 KLMDC,Heritage Campus, Ahmadabad, Gujarat, India	27	224	8.25



Citation Network of Authors

Highly Cited papers

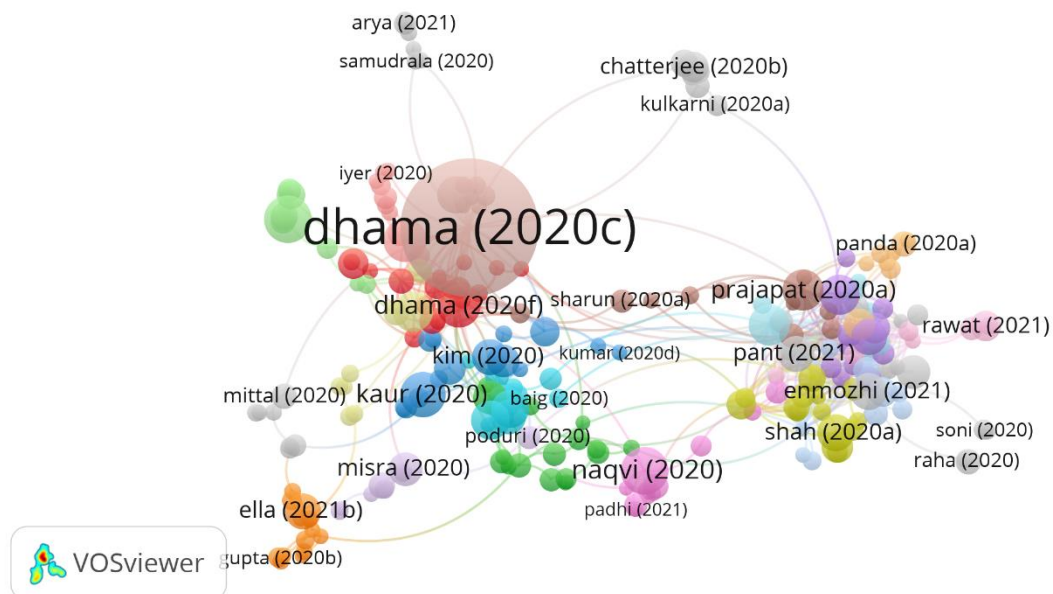
Of the 3169 papers, only 51 paper received 100 above citations and only one paper received 3903 citations (More than 1000 citations) and top 20 together received 8860 citations, averaging 443 CPP (Table 5). Many of these papers were international collaborative papers. The most cited papers are: Dhama K, Khan S, Tiwari R, Sircar S, Bhat S, et al., Coronavirus Disease 2019-COVID-19, CLINICAL MICROBIOLOGY REVIEWS. 2020 OCT; 33 (4) received 3903 citations followed by Chakraborty I, Maity P, COVID-19 outbreak: Migration, effects on society, global environment and prevention, SCIENCE OF THE TOTAL ENVIRONMENT. 2020 AUG 1; 728.

Table 5: Highly Cited papers

#	Date / Author / Journal	TC	CR
1	659 Dhama K, Khan S, Tiwari R, Sircar S, Bhat S, et al. Coronavirus Disease 2019-COVID-19 CLINICAL MICROBIOLOGY REVIEWS. 2020 OCT; 33 (4): Art. No. e00028-20	3903	366
2	527 Chakraborty I, Maity P, COVID-19 outbreak: Migration, effects on society, global environment and prevention, SCIENCE OF THE TOTAL ENVIRONMENT. 2020 AUG 1; 728: Art. No. 138882	526	25
3	360 Hussain A, Bhowmik B, Moreira NCD, COVID-19 and diabetes: Knowledge in progress, DIABETES RESEARCH AND CLINIC, AL PRACTICE. 2020 APR; 162: Art. No. 108142	327	80
4	696 Naqvi AA, Fatima K, Mohammad T, Fatima U, Singh IK, et al. Insights into SARS-CoV-2 genome, structure, evolution, pathogenesis and therapies: Structural genomics approach BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR BASIS OF DISEASE. 2020 OCT 1; 1866 (10): Art. No. 165878	326	148
5	717 Kaur SP, Gupta V COVID-19 Vaccine: A comprehensive status report VIRUS RESEARCH. 2020 OCT 15; 288: Art. No. 198114	302	108
6	611 Lamontagne F, Agoritsas T, Macdonald H, Leo YS, Diaz J, et al. A living WHO guideline on drugs for covid-19 BMJ-BRITISH MEDICAL JOURNAL. 2020 SEP 4; 370: Art. No. m3379	295	17
7	425 Dhama K, Sharun K, Tiwari R, Dadar M, Malik YS, et al. COVID-19, an emerging coronavirus infection: advances and prospects in designing and developing vaccines, immunotherapeutics, and therapeutics HUMAN VACCINES & IMMUNOTHERAPEUTICS. 2020 JUN 2; 16 (6): 1232-1238	273	77
8	481 Vellingiri B, Jayaramayya K, Iyer M, Narayanasamy A, Govindasamy V, et al., COVID-19: A promising cure for the global panic	266	187

	SCIENCE OF THE TOTAL ENVIRONMENT. 2020 JUL 10; 725: Art. No. 138277		
9	801Han E, Tan MMJ, Turk E, Sridhar D, Leung GM, et al. Lessons learnt from easing COVID-19 restrictions: an analysis of countries and regions in Asia Pacific and Europe LANCET. 2020 NOV 7; 396 (10261): 1525-1534	265	55
10	346Prajapat M, Sarma P, Shekhar N, Avti P, Sinha S, et al. Drug targets for coronavirus: A systematic review INDIAN JOURNAL OF PHARMACOLOGY. 2020 JAN-FEB; 52 (1): 56-65	246	90
11	1721Boopathi S, Poma AB, Kolandaivel P Novel 2019 coronavirus structure, mechanism of action, antiviral drug promises and rule out against its treatment JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS. 2021 JUN 13; 39 (9): 3409-3418	243	66
12	1483Muralidharan N, Sakthivel R, Velmurugan D, Gromiha MM Computational studies of drug repurposing and synergism of lopinavir, oseltamivir and ritonavir binding with SARS-CoV-2 protease against COVID-19, JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS. 2021 APR 9; 39 (7): 2673-2678	231	23
13	2329Mlcochova P, Kemp SA, Dhar MS, Papa G, Meng B, et al. SARS-CoV-2 B.1.617.2 Delta variant replication and immune evasion NATURE. 2021 NOV 4; 599 (7883): 114-+	227	37
14	347Malik YS, Sircar S, Bhat S, Sharun K, Dhama K, et al. Emerging novel coronavirus (2019-nCoV)-current scenario, evolutionary perspective based on genome analysis and recent developments VETERINARY QUARTERLY. 2020 JAN 1; 40 (1): 68-76	225	35
15	335Al-Mohaithef M, Padhi BK Determinants of COVID-19 Vaccine Acceptance in Saudi Arabia: A Web-Based National Survey JOURNAL OF MULTIDISCIPLINARY HEALTHCARE. 2020; 13: 1657-1663	211	31
16	655Lalmuanawma S, Hussain J, Chhakchhuak L Applications of machine learning and artificial intelligence for Covid-19 (SARS-CoV-2) pandemic: A review CHAOS SOLITONS & FRACTALS. 2020 OCT; 139: Art. No. 110059	208	46
17	421Koehler P, Bassetti M, Chakrabarti A, Chen SCA, Colombo AL, et al. Defining and managing COVID-19-associated pulmonary aspergillosis: the 2020 ECMM/ISHAM consensus criteria for research and clinical guidance LANCET INFECTIOUS DISEASES. 2020 JUN; 21 (6): E149-E162	206	82
18	420Bhattacharya M, Sharma AR, Patra P, Ghosh P, Sharma G, et al.	198	26

	Development of epitope-based peptide vaccine against novel coronavirus 2019 (SARS-COV-2): Immunoinformatics approach JOURNAL OF MEDICAL VIROLOGY. 2020 JUN; 92 (6): 618-631		
19	1717 Enmozhi SK, Raja K, Sebastine I, Joseph J Andrographolide as a potential inhibitor of SARS-CoV-2 main protease: an in silico approach, JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS. 2021 JUN 13; 39 (9): 3092-3098	192	32
20	578 Machhi J, Herskovitz J, Senan AM, Dutta D, Nath B, et al. The Natural History, Pathobiology, and Clinical Manifestations of SARS-CoV-2 Infections, JOURNAL OF NEUROIMMUNE PHARMACOLOGY. 2020 SEP; 15 (3): 359-386	190	249



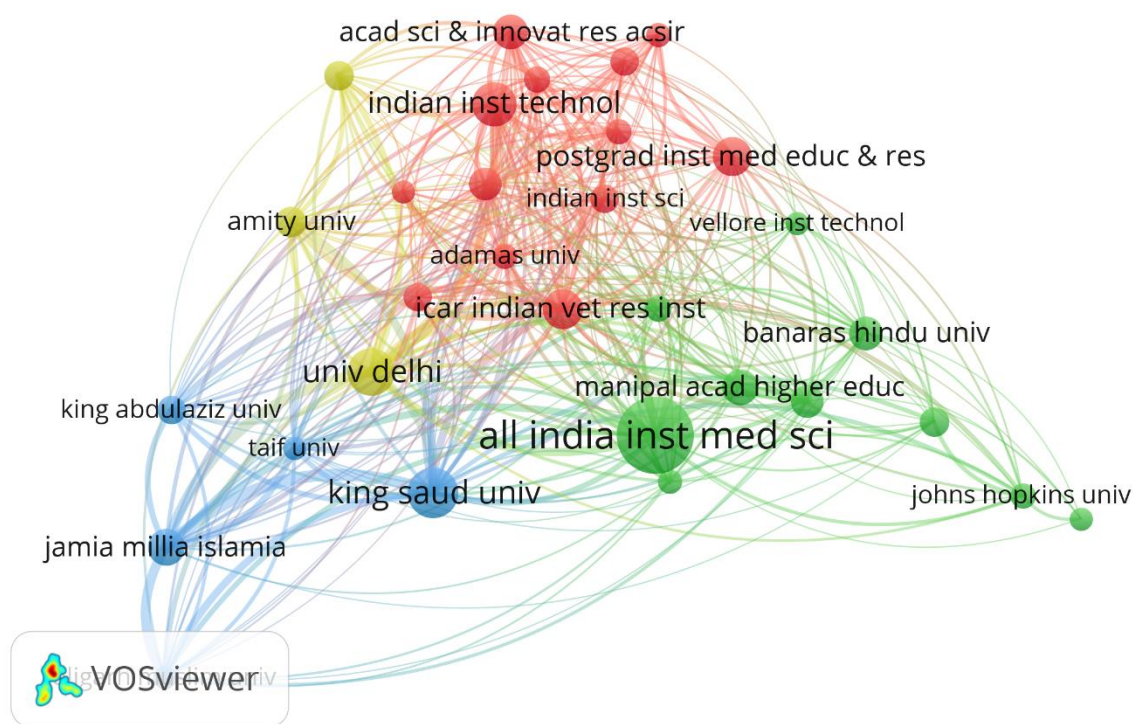
Citation Network of Documents

Most Active Institutions

Contributions and impact of 25 most productive Indian institutions participating in Covid-19 Drugs, Medicine and Vaccine and together contributed 1224 research papers. Only 8 institutions recorded publications output more than 50 papers output of the all institutions and 10 institutions with more 1000 citations. These are All India Institute of Medical Sciences, New Delhi with 177 publications (TC=2244), followed by University of Delhi with 79(TC=1185), IIT with 74(TC=880), ICAR Indian Vet Res Institute with 64(TC=5539) and Postgrad Institute Med Education & Res with 60 (1105 Citations). The average citation impact recorded by these 25 institutions was 16.59(TC=20314) during the study period.

Table 5: The most active Institutions

#	Institution	TP	TC
1	All India Institute Medical Science	175	2244
2	University of Delhi	79	1185
3	Indian Institute Technology	74	880
4	ICAR Indian Vet Res Institute	64	5539
5	Postgrad Institute Med Education & Res	60	1105
6	JamiaMilliaIslamia	55	982
7	Manipal Acad Higher Education	55	440
8	Acad Science &Innovat Res AcSIR	51	616
9	Indian Council Med Res	47	950
10	Banaras Hindu University	46	387
11	Jadavpur University	46	679
12	Amity Univ	41	423
13	Christian Med Coll&Hosp	41	454
14	Jawaharlal Nehru Univ	39	362
15	Indian InstSci	37	289
16	JamiaHamdard	37	379
17	Natl InstTechnol	34	244
18	CSIR	33	362
19	Adamas Univ	32	693
20	Dr DY Patil Univ	32	72
21	Alagappa Univ	31	532
22	All India Inst Med Sci AIIMS	30	308
23	Cent Univ Punjab	30	364
24	Aligarh Muslim Univ	28	599
25	VIT	27	226



Citation Network of Institutions

Subject-wise Research Priorities in Covid-19 Drugs, Medicine and Vaccine

The Covid-19 Drugs, Medicine and Vaccine research output was classified under broad subject areas as per Web of Science classification, with maximum research output (579 papers) from falling under Biochemistry Molecular Biology, followed by Pharmacology Pharmacy(442 papers), Immunology with 311, Biophysics with 305 and Medicine Research Experimental with 217 Papers. Of these, 16 subjects contributed more than 100 publications and the maximum of 579. In the context of open access, the maximum contribution by Immunology with 4498 publications followed by Medicine General Internal with 4416 and Medicine Research Experimental with 3266 papers.

Table 6: Subject Areas

Web of Science Categories	TP	%
Biochemistry Molecular Biology	579	18.088
Pharmacology Pharmacy	442	13.808
Immunology	311	9.716
Biophysics	305	9.528
Medicine Research Experimental	217	6.779

Chemistry Multidisciplinary	197	6.154
Infectious Diseases	182	5.686
Medicine General Internal	169	5.280
Chemistry Medicinal	163	5.092
Biotechnology Applied Microbiology	159	4.967
Public Environmental Occupational Health	155	4.842
Microbiology	129	4.030
Multidisciplinary Sciences	125	3.905
Biology	106	3.311
Virology	104	3.249
Computer Science Interdisciplinary Applications	101	3.155

FINDINGS AND CONCLUSION

Among the various infectious diseases, Covid-19 pandemic has possibly emerged as the one of the most devastating pandemic in the recent times. It led to lockdown in most of the countries. Accordingly, this paper analyzes the research output on the topic of Covid-19 Drugs, Medicine and Vaccine emerging from India using a bibliometric method. Our findings suggest that 8.03% share to global research output (40348 papers) on the topic, emerged from India, with an average citation impact of 12.66 CPP (TC=40132). Overall India ranked in the 5th position in the world research output on the topic of Covid-19 Drugs, Medicine and Vaccine. Of the 3169 publications, articles constituted the largest publication share (52.6%), followed by Review (28.5%), Article; Early Access (7.4%), Letter (4.7%) and Editorial Materials (3.5%). Another important aspect of the present bibliometric study is that it suggests that although majority of the publications emerging from institutes like All India Institute of Medical Sciences, University of Delhi, IIT, ICAR Indian Vet Res Institute and Postgrad Institute Med Education & Res. These findings suggest that pandemic has possibly contributed to change in the landscape of the Indian research and this may have significant positive impact on the research output from India.

The majority of the papers were published in journals, with a maximum number of publications in the JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS (252), HUMAN VACCINES & IMMUNOTHERAPEUTICS (55), COMPUTERS IN BIOLOGY AND MEDICINE (45), FRONTIERS IN PHARMACOLOGY (40) and JOURNAL OF MOLECULAR STRUCTURE (36). Publications of the maximum number of publications in the JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS could be due to the author-friendly editorial policies of faster review of the articles. Our analysis has certain limitations. We did not evaluate the quality of the papers and our search was limited to Web of Science database. To conclude, this bibliographic analysis suggests that researchers from India contributed to about 8.03 % of the global research on the topic of Covid-19 Drugs, Medicine and Vaccine. It is suggested that Indian government and health establishment in the country should look at national health policy more

critically, reorient their research priorities and help bring more funds for research in Covid-16 Drugs, Vaccine and Medicine. Further, there is need to strengthen the existing international linkages and create new international linkages for increasing the research output and quality. Also within the country, there is a need for close collaboration between clinical research and basic science researchers in Drugs, Vaccines and Medicine.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest

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