

Highly Cited Works In Covid-19 Drugs, Vaccine And Medicine: A Scientometric Study

Y. Arputha Sahaya Rani¹, A. Shanmuganathi², Dr. M. Surulinathi³

¹Research Scholar, Department of Library and Information Science, Bharathidasan University,
Tiruchirappalli- 620 024.

²Research Scholar, Department of Library and Information Science, Bharathidasan
University, Tiruchirappalli- 620 024.

³Assistant Professor, Department of Library and Information Science, Bharathidasan University,
Tiruchirappalli- 620 024.

Abstract

This paper attempts to highlight the growth and development of Covid-19 drugs, Vaccines, and medicine literature and make the quantitative and qualitative assessment by way of analyzing various features of research output and Citations impact based on the Web of Science database. A total of 3133 publications were published on Covid-19 drugs, Vaccines, and medicine, which received 966321 Citations in 2022. In all, there were 116 countries involved in research on Covid-19 drugs, Vaccines, and medicine. The most productive countries are the USA highest share of 1814(28.4%) publications and received 17779 Citations followed by the Peoples' Republic of China with 18623 Citations for 986(15.5%) publications, Italy with 7418 Citations for 763(12%) publications, India with 3323 Citations for 617(9.7%) publications, the UK with 7178 Citations for 577 publications. The most productive Institutions were: Harvard Med School in the USA with 102 publications (1175 Citations), followed by Huazhong Univ Science & Technology with 102 publications (2913 Citations), and University Milan with 82 publications (1430 citations), It noted that 30 Institutes are registered more than 30 Publications and 25 Institutions are recorded more than 1000 Citations. The highly Cited journals are NEW ENGLAND JOURNAL OF MEDICINE with 2623 Citations (ACPP is 163.93) for 16 Publications, NATURE with 1546 Citations (ACPP is 96.62) for 16 publications, JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS with 1476 Citations (ACPP is 9.11) for 162 publications, JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION with 1365 Citations (ACPP is 39.08) for 35 publications, and SCIENCE with 1197 Citations (ACPP is 74.81) for 16 publications. The study found that 8 source titles registered more than 1000 Citations and most of the publications are published in high-impact journals. The paper also reveals the collaborating institutions, countries, and research. Findings also indicate the publication pattern, degree of collaboration as well as nature of the research activities.

Keywords: Covid-19 Drugs, Vaccine and Medicine

Description	Results	Description	Results
Main Information About Data			
Timespan	2020:2022	Document Contents	
Sources (Journals, Books, etc)	761	Keywords Plus (ID)	2859
Documents	3133	Author's Keywords (DE)	3049
Average years from publication	1.87	Authors	
Average citations per document	308.4	Authors	28529
Average citations per year per doc	107.7	Author Appearances	41689
References	61872	Authors of single-authored documents	77
Document Types		Authors of multi-authored documents	28452
article	1942	Authors Collaboration	
article; data paper	1	Single-authored documents	86
article; early access	8	Documents per Author	0.11
article; proceedings paper	2	Authors per Document	9.11
article; retracted publication	1	Co-Authors per Documents	13.3
correction	1	Collaboration Index	9.34
editorial material	354		
letter	267		
news item	3		
retraction	1		
review	553		

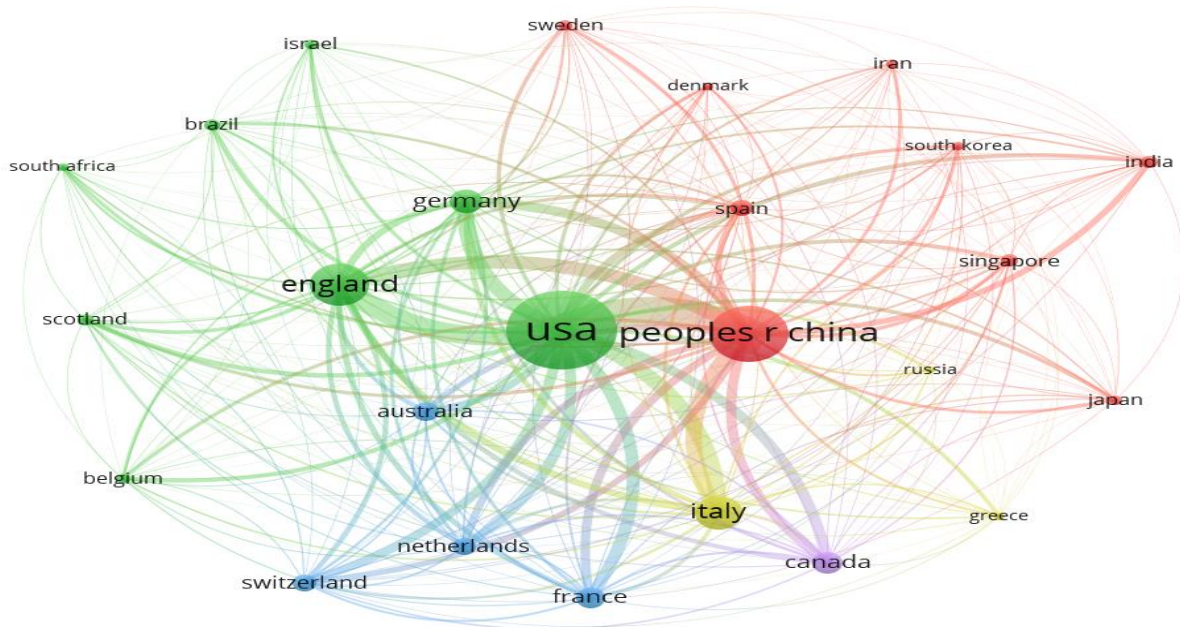
Most Productive Countries

In total, 3133 publications in the field of Covid-19 medicines, vaccines, and medicine were indexed, with 966321 citations coming from 116 countries. The United States had the most citations with 397517 for 1376 publications, followed by Peoples R China with 359853 for 839, the United Kingdom with 186845 for 579, Italy with 101756 for 400, and Germany with 86964 for 248. According to the survey, 31 countries had more than 10,000 citations, seven had more than 5,000, eleven had more than 1000, and fourteen had more than 500. India ranked 12th with 24734 Citations, according to the report.

Table -1 Most Productive Countries

S.No	Country	Records	%	citations
------	---------	---------	---	-----------

1	USA	1376	43.9	397517
2	Peoples R China	839	26.8	359853
3	UK	579	18.5	186845
4	Italy	400	12.8	101756
5	Germany	248	7.9	86964
6	Canada	209	6.7	58401
7	France	207	6.6	58439
8	Australia	172	5.5	49216
9	Netherlands	159	5.1	53929
10	Switzerland	148	4.7	47434
11	Spain	147	4.7	43110
12	India	97	3.1	24734
13	Singapore	95	3.0	35846
14	Brazil	90	2.9	28861
15	Belgium	82	2.6	23413
16	Sweden	77	2.5	22063
17	Japan	65		22970
18	Israel	64		14601
19	Iran	60		13836
20	Denmark	55		21224



Most Productive Countries

Most Active Authors

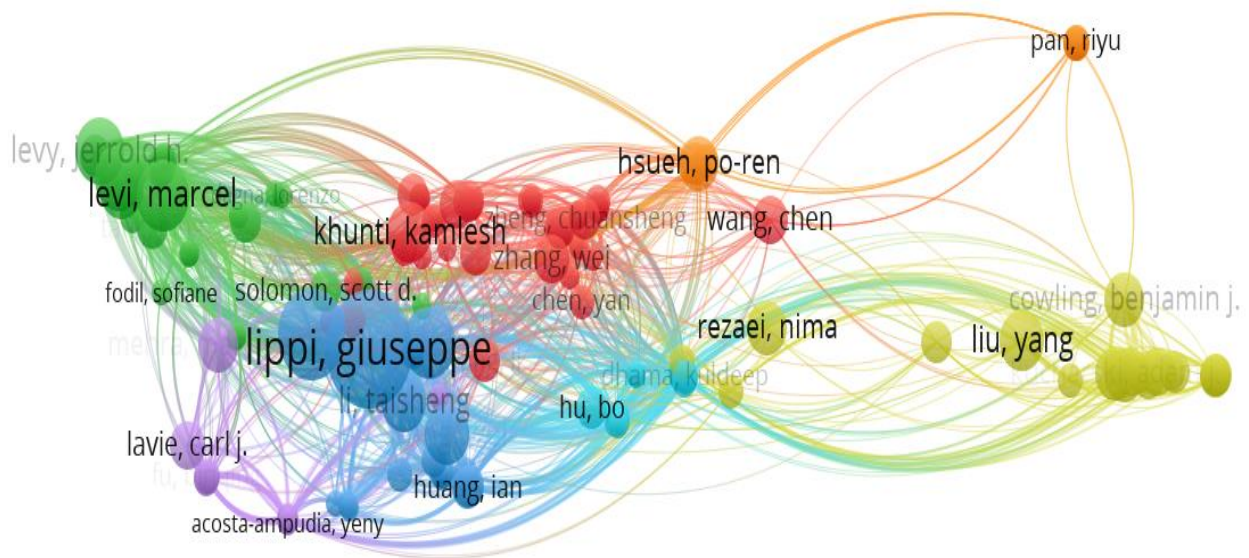
28529 authors participated unevenly in global research on “Covid-19 drugs, Vaccine, and medicine”: The top 20 authors individually contributed 10 to 43 papers each and together contributed 4.63% (243) and 7.66% (5368) shares in global publications and citations. On further analysis, it was observed that: (i) Five authors contributed papers higher than their group average (12.15): J. Sterer (24 papers), F.A. Scorza (20 papers), E. Moro (14 papers), M.L.R. Neto and G. Tsigoulis (13 papers each); (ii) Four authors registered citation per paper and relative citation index above their group average (22.09 and 1.65): Z.Liu (169.7 and 12.7), M.L.R.Neto (54.92 and 4.11), G. Tsigoulis (45.54 and 3.41) and A.A. Asadi-Pooya (39.2 and 2.93).

Table – 2 Most Active Authors

S.No	Author	Author Affiliations	Records	Total Citations
1	Liu Y	Xiamen Univ, SchInt Business, Tan KahKeeColl, Zhangzhou 363105, Peoples R China.	43	48447
2	Liu L	Shanghai PublHlthClinCtr, Dept Infect Dis &Immunol, Shanghai 201508, Peoples R China.	32	33700

3	Xiang J	China Japan Friendship Hosp, InstClin Med Sci, Beijing, Peoples R China.	6	30463
4	Hu Y	Huazhong Univ Sci&Technol, Tongji Med Coll, Union Hosp, Wuhan, Peoples R China.	20	30201
5	Zhang Y	Peking Union Med CollHosp, Beijing, Peoples R China.	32	29645
6	Zhou F	Chinese Acad Med Sci, Peking Union Med Coll, Dept Pulm &Crit Care Med, InstRespMed, NatlClin Res CtrRespDis, CtrResp, Beijing, Peoples R China.	8	21676
7	Yuen KY	Univ Hong Kong, State Key Lab Emerging Infect Dis, Pokfulam, Hong Kong, Peoples R China.	20	21498
8	Wang T	Tongji Univ, Shanghai East Hosp, Sch Med, 150 Jipo Rd, Shanghai 200123, Peoples R China.	12	20981
9	Li L	Wuhan Huangpi Peoples Hosp, Dept Radiol, Wuhan, Peoples R China.	23	20951
10	Li H	Univ South China, Affiliated Hosp 1, Hengyang Med Coll, DeptIntens Care Unit, Hunan Pro, Med Res ExptCtr, InstCardiovascDis, Key Lab Arte, Hengyang 421001, Hunan, Peoples R China.	22	20166
11	Liu J	Huazhong Univ Sci&Technol, Dept Infect Dis, Union Hosp, Tongji Med Coll, Wuhan 430022, Peoples R China.	26	19149
12	Chen Z	Chinese Peoples Liberat Army Gen Hosp, Med Ctr 5, Infect Dis Dept, Beijing, Peoples R China.	17	19034
13	Cao B	China Japan Friendship Hosp, CtrResp Med, Dept Pulm &Crit Care Med, Natl Clin Res CtrResp Dis, Beijing, Peoples R China.	7	18969

14	Chen H	Soochow Univ, Affiliated Hosp 1, Suzhou, Peoples R China.	12	18689
15	Du B	Chinese Acad Med Sci, Beijing 100730, Peoples R China.	9	17948
16	Wang J	Nanjing Univ, Dept Infect Dis, Med Sch, Nanjing Drum Tower Hosp, Nanjing 210008, Jiangsu, Peoples R China.	40	17728
17	Peng P	Cent Hosp Wuhan, Wuhan, Hubei, Peoples R China.	12	17699
18	Wang Y	Chinese Acad Med Sci, InstResp Med, Beijing, Peoples R China.	34	17698
19	Wang JL	Jin Yin Tan Hosp, Wuhan, Peoples R China.	5	17026
20	Shan H	Sun Yat Sen Univ, Affiliated Hosp 5, Dept Radiol, Zhuhai, Guangdong, Peoples R China.	12	16950



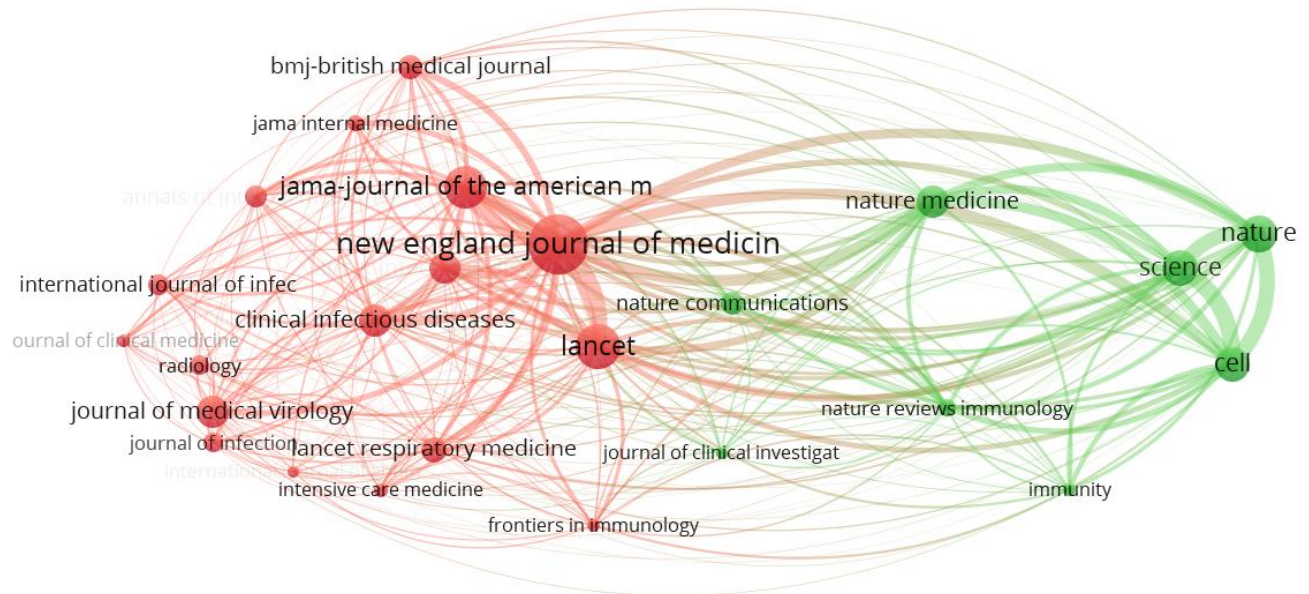
Top 20 Most Productive Journals

A total of 761 journals took part in the study on "Covid-19 medicines, vaccines, and medicine." The top 20 journals each produced between 21 and 135 publications, accounting for 42.46 percent

of global publication output (2227). NEW ENGLAND JOURNAL OF MEDICINE (135 papers) has 91.24 percent, LANCET (87 papers) has 44.2 percent, JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (82 papers) has 56.3 percent, NATURE (66 papers) has 49.96 percent, SCIENCE (62 papers) has 47.8 percent, CLINICAL INFECTIOUS DISEASES (54 papers) has 8.31 percent, and CELL

Table-3 Most Productive Journals

#	Journal	Impact Factor	Records	Citations
1	NEW ENGLAND JOURNAL OF MEDICINE	91.24	135	94860
2	LANCET	44.182	87	49890
3	JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION	56.27	82	37591
4	NATURE	49.96	66	26546
5	SCIENCE	47.728	62	24660
6	CLINICAL INFECTIOUS DISEASES	8.313	54	23025
7	CELL	41.58	60	21246
8	NATURE MEDICINE	53.44	54	20578
9	LANCET INFECTIOUS DISEASES	25.071	52	16554
10	LANCET RESPIRATORY MEDICINE	30.7	37	15090
11	JOURNAL OF MEDICAL VIROLOGY	2.327	54	14824
12	BMJ-BRITISH MEDICAL JOURNAL	39.89	36	14286
13	RADIOLOGY	11.1	26	11579
14	ANNALS OF INTERNAL MEDICINE	25.39	31	10647
15	JAMA INTERNAL MEDICINE	21.87	20	9127
16	JOURNAL OF INFECTION	6.072	26	8847
17	INTENSIVE CARE MEDICINE	17.44	16	7881
18	INTERNATIONAL JOURNAL OF ANTIMICROBIAL AGENTS	4.31	12	7775
19	INTERNATIONAL JOURNAL OF INFECTIOUS DISEASES	2.86	28	7743
20	BRAIN BEHAVIOR AND IMMUNITY	7.217	21	7509



The most Significant Keywords

The 20 Keywords (with a comparatively higher frequency of appearance varying from 114 to 2351) have been identified from the literature and considered as significant as they throw some light on the trends of research on his theme. These 20 keywords are listed in this Table. The largest frequency of occurrence (3595) was reported by keyword “Covid-19”, followed by “Mental Health” (663), “Depression” (628), “Anxiety” (626), “Mental Disease” (460), “Neurological Disease” (384), "Multiple Sclerosis" (324), "Headache" (316),” Cerebrovascular Accidents” (291), etc.

#	Word	Records	Citations
1	COVID	2351	712754
2	SARS	697	220659
3	COV	675	212522
4	PATIENTS	592	209004
5	CORONAVIRUS	485	190952
6	DISEASE	411	160978
7	CLINICAL	262	110620
8	CHINA	162	99113
9	PANDEMIC	302	69409
10	REVIEW	223	67877

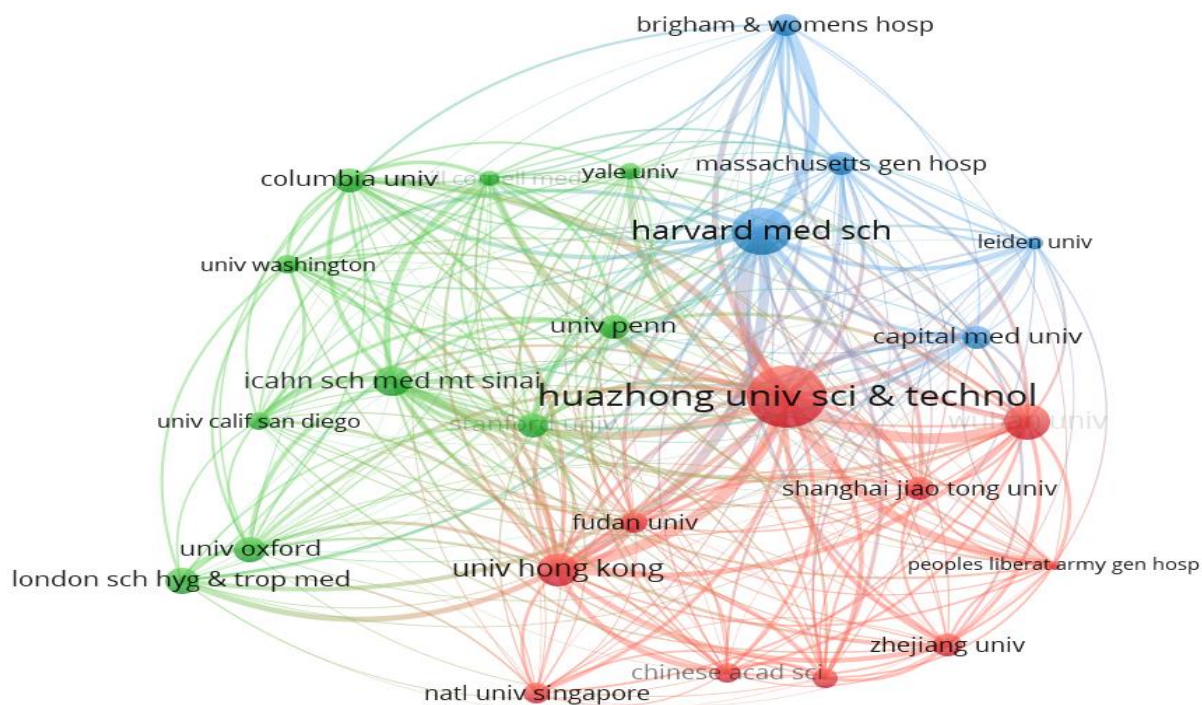
11	SEVERE	188	65542
12	INFECTION	231	64867
13	HEALTH	206	61740
14	ANALYSIS	180	51485
15	RISK	135	50177
16	CHARACTERISTICS	118	50131
17	VACCINE	159	48864
18	ASSOCIATED	140	48170
19	WUHAN	67	46230
20	MORTALITY	114	44165

Most Productive Organizations

The top 20 organizations individually contributed 74 to 176 papers and together contributed 31.33% (3133 papers) and 48.47% (33967) share respectively share in global publications and citations. On further analysis, it was observed that: (i) Six organizations contributed papers higher than their group average (67.75): Harvard Medical School, USA (142 papers), University of Toronto, Canada (101 papers), INSERM, France (99 papers), King's College, London, U.K. (94 papers), University College London, U.K. (85 papers) and University of Oxford, U.K. (80 papers), and (ii) Seven organizations registered citation per paper and relative citation index above their group average (25.07 and 1.88): the University of Cambridge, U.K. (72.97 and 5.46), King's College London, U.K. (49.97 and 3.74), University College London, U.K. (47.58 and 3.56), University of Melbourne, U.K. (42.76 and 3.20), University of Oxford, U.K. (38.96 and 2.92), Tongji Medical College, China (36,82 and 2.76) and University of British Columbia, Canada (31.41 and 2.35) (Table 5).

#	Institution	Records	Citations
1	Huazhong Univ Science& Technology	176	87724
2	Harvard Med School	176	52652
3	Univ Hong Kong	71	50784
4	Univ Oxford	108	44294
5	Capital Med Univ	54	35767
6	UCL	81	34584

7	Wuhan University	89	33695
8	Icahn School Med Mt Sinai	84	32005
9	Sun Yat Sen Univ	50	31880
10	Wuhan Pulm Hospital	14	30266
11	Univ Cambridge	66	29923
12	Southern Univ Science& Technology	21	29692
13	Chinese Acad Med Science	41	29028
14	Univ Washington	80	28598
15	Tsinghua Univ	30	28445
16	Guangzhou Med Univ	44	28320
17	Zhejiang Univ	43	27787
18	Kings College London	79	27148
19	Shenzhen Third Peoples Hospital	12	26703
20	Columbia Univ	74	24421



Highly Cited papers

Out of 1,24,970 total publications, 3133 obtained 100 to 12528 citations (assumed high-cited papers), for a total of 966321 citations. Out of the 3133 high-cited works, 272 received 100-200 citations. There are 207 papers with citations ranging from 201 to 500 and 113 papers with citations ranging from 500 to 1000. 79 papers have 1000-2000 citations and five papers that have 1147-1609 citations. Of the 3133 high-cited works, 1942 were published as articles, 553 as reviews, 354 as Editorial Materials, 267 as Letters, and 8 as Early Access; the rest of the data appeared to be the same. USA contributed the largest number of papers (1376) in 3133 high-cited papers, followed by China (839 papers), the U.K. (579 papers), Italy (400 papers), Germany (248 papers), Canada (209 papers), France (207), Australia (172 papers), Netherlands (159 papers), Switzerland (148 papers), Spain (147 papers), India (97 papers), Singapore (95 papers), Brazil (90 papers), Belgium (82 papers), Sweden (77 papers), Japan (65 papers), Israel (64 papers), Iran (60 papers), Denmark (55 papers), etc.

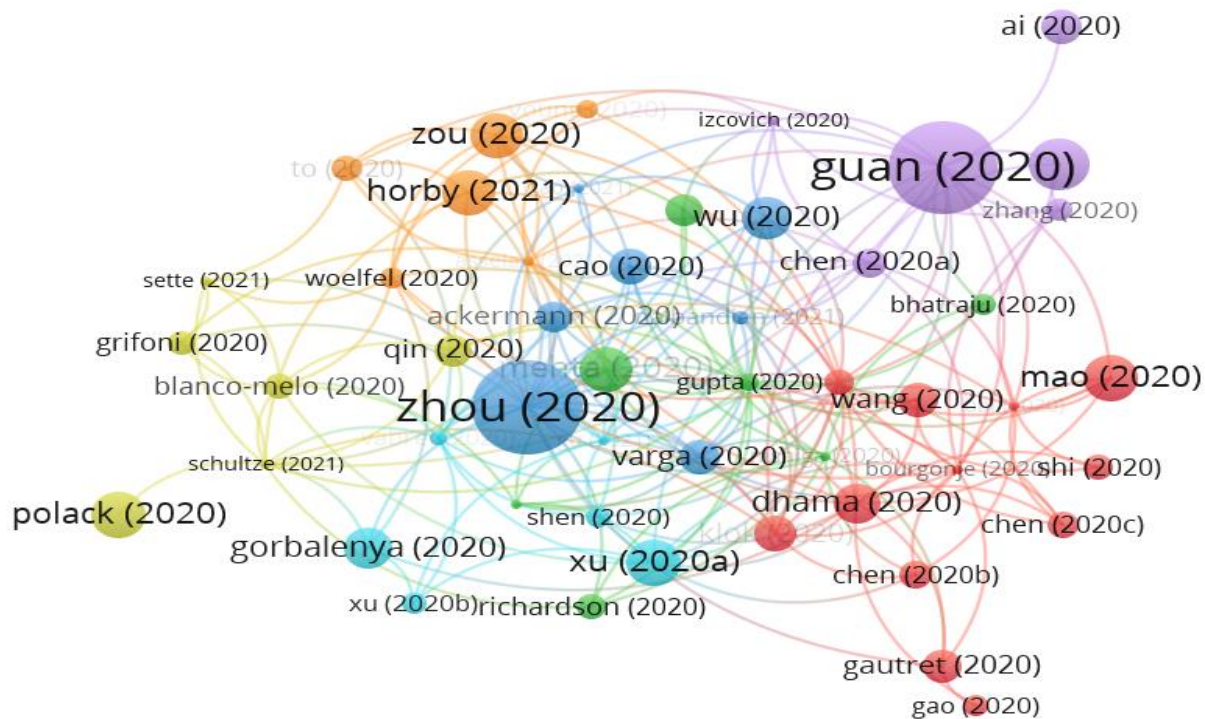
3133 high-cited papers, 6523 organizations, and 28529 authors precipitated. The 3133 high-cited papers are published in 761 journals, of which 37 papers are published in LANCET, 23 papers in NEW ENGLAND JOURNAL OF MEDICINE, 10 papers in CLINICAL INFECTIOUS DISEASES, 6 papers in JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 5 papers in LANCET RESPIRATORY MEDICINE, 16 papers in JAMA NEUROLOGY, 12 papers each in NEW ENGLAND JOURNAL OF MEDICINE.

#	Date / Author / Journal	Author Countries	Citation	Citation Reference
1	169 Zhou F, Yu T, Du RH, Fan GH, Liu Y, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study LANCET. 2020 MAR 28; 395 (10229): 1054-1062	China	12528	37
2	369 Guan W, Ni Z, Hu Y, Liang W, Ou C, et al. Clinical Characteristics of Coronavirus Disease 2019 in China NEW ENGLAND JOURNAL OF MEDICINE. 2020 APR 30; 382 (18): 1708-1720	China	12120	23
3	2436 Zhao JJ, Yuan Q, Wang HY, Liu W, Liao XJ, et al. Antibody Responses to SARS-CoV-2 in Patients With Novel Coronavirus Disease 2019	China	7616	10

	CLINICAL INFECTIOUS DISEASES. 2020 OCT 15; 71 (16): 2027-2034			
4	313Bai Y, Yao LS, Wei T, Tian F, Jin DY, et al. PresumedAsymptomaticCarrierTransmission of COVID-19 JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. 2020 APR 14; 323 (14): 1406-1407	China	5090	6
5	261Xu Z, Shi L, Wang YJ, Zhang JY, Huang L, et al. Pathologicalfindings of COVID-19 associated with acuterespiratorydistresssyndrome LANCET RESPIRATORY MEDICINE. 2020 APR; 8 (4): 420-422	China	4316	5
6	904Mao L, Jin HJ, Wang MD, Hu Y, Chen SC, et al. NeurologicManifestations of HospitalizedPatients With CoronavirusDisease 2019 in Wuhan, China JAMA NEUROLOGY. 2020 JUN; 77 (6): 683-690	China	4276	16
7	2727Polack FP, Thomas SJ, Kitchin N, Absalon J, Gurtman A, et al. Safety and Efficacy of the BNT162b2mRNACovid-19 Vaccine NEW ENGLAND JOURNAL OF MEDICINE. 2020 DEC 31; 383 (27): 2603-2615	Argentina, USA, England, Brazil, Germany, and Turkey	4241	12
8	2892Horby P, Lim WS, Emberson JR, Mafham M, Bell JL, et al. Dexamethasone in HospitalizedPatients with Covid-19 NEW ENGLAND JOURNAL OF MEDICINE. 2021 FEB 25; 384 (8): 693-704	England, Wales, and Scotland	4225	40
9	166Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, et al. COVID-19: consider cytokinestormsyndromes and immunosuppression LANCET. 2020 MAR 28; 395 (10229): 1033-1034	England and North Ireland	4109	11
1 0	145Zou LR, Ruan F, Huang MX, Liang LJ, Huang HT, et al.	China	4100	5

	<p>SARS-CoV-2 ViralLoad in UpperRespiratorySpecimens of InfectedPatients NEW ENGLAND JOURNAL OF MEDICINE. 2020 MAR 19; 382 (12): 1177-1179</p>			
1 1	<p>1398Wu CM, Chen XY, Cai YP, Xia JA, Zhou X, et al. RiskFactorsAssociated With AcuteRespiratoryDistressSyndrome and Death in Patients With CoronavirusDisease 2019 Pneumonia in Wuhan, China JAMA INTERNAL MEDICINE. 2020 JUL; 180 (7): 934-943</p>	China	3700	23
1 2	<p>268Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, et al. The speciesSevereacuterespiratorysyndrome- relatedcoronavirus: classifying 2019-nCoV and naming it SARS-CoV-2 NATURE MICROBIOLOGY. 2020 APR; 5 (4): 536- 544</p>	Netherland, Russia, USA, Germany, China, and Spain	3669	59
1 3	<p>2288Dhama K, Khan S, Tiwari R, Sircar S, Bhat S, et al. CoronavirusDisease 2019-COVID-19 CLINICAL MICROBIOLOGY REVIEWS. 2020 OCT; 33 (4): Art. No. e00028-20</p>	India Thailand and Colombia	3429	366
1 4	<p>2585Beigel JH, Tomashek KM, Dodd LE, Mehta AK, Zingman BS, et al. Remdesivir for the Treatment of Covid-19- FinalReport NEW ENGLAND JOURNAL OF MEDICINE. 2020 NOV 5; 383 (19): 1813-1826</p>	USA, Spain, Greece, Japan, South Korea, Germany, and England	2985	16
1 5	<p>1557Klok FA, Kruip MJHA, van der Meer NJM, Arbous MS, Gommers DAMPJ, et al. Incidence of thromboticcomplications in criticallyillICUpatients with COVID-19</p>	Netherland	2876	5

	THROMBOSIS RESEARCH. 2020 JUL; 191: 145-147			
1 6	633Cao B, Wang Y, Wen D, Liu W, Wang JL, et al. A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19 NEW ENGLAND JOURNAL OF MEDICINE. 2020 MAY 7; 382 (19): 1787-1799	China, England, and the USA	2867	24
1 7	611Varga Z, Flammer AJ, Steiger P, Haberecker M, Andermatt R, et al. Endothelial cell infection and endotheliitis in COVID-19 LANCET. 2020 MAY 2; 395 (10234): 1417-1418	Switzerland and USA	2846	11
1 8	2867Baden LR, El Sahly HM, Essink B, Kotloff K, Frey S, et al. Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine NEW ENGLAND JOURNAL OF MEDICINE. 2021 FEB 4; 384 (5): 403-416	USA	2780	28
1 9	1881Ai T, Yang ZL, Hou HY, Zhan CN, Chen C, et al. Correlation of Chest CT and RT-PCR Testing for Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases RADIOLOGY. 2020 AUG; 296 (2): E32-E40	China and Netherland	2773	14
2 0	150Lai JB, Ma SM, Wang Y, Cai ZX, Hu JB, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019 JAMA NETWORK OPEN. 2020 MAR 23; 3 (3): Art. No. e203976	China	2761	22



Conclusion

The literature on this topic "Covid-19 and Neurosciences" has been analyzed using bibliometric methods. It identified the major players (countries, organizations, authors journals, and keywords) and studied their collaboration linkages among them. It will help the decision-makers to identify the area of strength and areas which need to be funded for future research. It will also inform and improve decision-making among physicians treating Covid-19 and scholars researching this area. It will also aid in the recognition of significant extra-pulmonary manifestations of the disease among attending front-line clinicians and consulting neurologists and also help them in understanding the pandemic's broader impact on chronic disease management.

Reference

- Ellul MA, Benjamin L, Singh B, et al. Neurological associations of COVID-19. *Lancet Neurol* 2020.
- Garg RK, Paliwal VK, Gupta A. Encephalopathy in patients with COVID-19: a review. *J Med Virol* 2020;0140
- Paterson RW, Brown RL, Benjamin L, et al. The emerging spectrum of COVID-19 neurology: clinical, radiological, and laboratory findings. *Brain* 2020;143, 3104–20.
- Tan, Lynn, Lin, Zhiliang Caleb, Wesselingh, Robb, McFadyen, James, Kapoor, Mahima, and Hutton, Elspeth. Neurological implications of COVID-19: a review of the science and clinical

guidance. BMJ Neurology Open December 2020,
2(2)<https://neurologyopen.bmj.com/content/2/2/e000101>

- Nepal, G., Rehrig, J.H., Shrestha, G.S., et al. Neurological manifestations of COVID-19: a systematic review. Crit Care **24**, 421 (2020). <https://doi.org/10.1186/s13054-020-03121-z>
- Gupta BM, Dhawan SM, Ahmed KKM, Mamdapur GM. Global Research on COVID-19 Disease: A Scientific Assessment of Publications during 2020-21. Int J Med Public Health. 2021;11(2):76-84.
- Muthuraj, Surulinathi; Balasubramani, R.; and N, AMSAVENI, "COVID-19 research output in 2020: The Global Perspective using Scientometric Study" (2020). Library Philosophy and Practice (e-journal). 4196. <https://digitalcommons.unl.edu/libphilprac/4196>
- M. A Holistic Investigation of Global Outputs of Covid-19 Publications in Neurology and Neurosurgery. EJMI 2020;4(4):506–512
- XRecords: 3133, Authors: 28529, Journals: 761, Cited References: 61185, Words: 4088
- Yearly output | Document Type | Language | Institution | Institution with Subdivision | Country.