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Research output on Covid-19/Coronavirus Vaccine: A Scientometric Study

Surulinathi M
Bharathidasan University, surulinathi@gmail.com

Arputha Sahaya Rani Y
Bharathidasan University

Srinivasaragavan S
Bharathidasan University

Jayasuriya T
Bharathidasan University

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Research output on Covid-19/Coronavirus Vaccine: A Scientometric Study

M. Surulinathi, Assistant Professor, Department of Library and Information Science,
Y. Arputha Sahaya Rani, Research Scholar, Department of Library and Information Science,
S. Srinivasaragavan, Professor, Department of Library and Information Science
T. Jayasuriya, Final year MLIS, Department of Library and Information Science,
Bharathidasan University, Tiruchirappalli -24, India

Corresponding Author: **M. Surulinathi**, surulinathi@gmail.com

ABSTRACT

This article presents a Scientometric analysis of Covid-19 Vaccine research Literature indexed by Web of Science. Assessing research activity is important for planning future protective and adaptive policies. The objective of the current study was to assess research activity on Covid-19 Vaccine literature. A Scientometric method was applied using Scopus, Documents on "Covid-19 literature". The study period was from 1971 to 2020. The search query found 7181 documents in Coronavirus Vaccine literature. The growth of publications showed 4402 in 2020. Documents published in Vaccine journal received the highest number of publications (203) followed by Journal of Virology with 104 Publications, Nature with 96 Publications. The most productive countries are i.e. the United States with 2178 (H-Index-114), Chine with 1068 (H-Index-75, India with 678 (H-Index-26), and the United Kingdom with 614 (H-Index-53).
Keywords: Covid-19 Vaccine, Coronavirus Vaccine, Scientometrics, H-Index

INTRODUCTION

Scientometrics studies have been applied mainly to scientific fields and empirical investigation of publications in specific scientific fields and subfields. It examines quantitative aspects of science, and scientific communication. This type of analysis provides useful indicators of scientific productivity and trends in the particular field. The term scientometric was coined in Russia by Nalimov. Since Nalimov's coinage of the Russian equivalent of the term 'Scientometrics' (naukometriya) in 1969, this term has grown in popularity and is used to describe the study of science: growth, structure, interrelationships and productivity (Hood & Wilson1). According to Haiturn2 "Scientometric" is a scientific discipline which performs reproducible measurement of scientific activity and reveals it objective quantitative regularities. Hence, scientometric studies aims to integrate the cognitive or intellectual structure of research with a view to appraise the relations among the authors, institutions, journal articles and as a means of assisting the peer-review procedure. The main purpose of the scientometric studies is to determine the state and prospect of a subject and its future development. The present study aims to apply the scientometric technique to know the publication trends in the field of Covid-19 Vaccine/Coronavirus Vaccine.

OBJECTIVES OF THE STUDY

The present study was conducted with the objective of analysing the literature on Covid-

19 Vaccine using various Bibliometric/Scientometric parameters, viz. (a) publication pattern and Growth of Publications, (b) impact of Authors, Institutions and Source titles as measured from citations, Cite Score, SNIP and SJR, (c) pattern of Collaboration, (d) highly cited papers, (e) major contributing organizations and countries (f) major funding sponsors over the years and (g) H-index for Author, Institutions.

METHODOLOGY

For this study, the metadata of publications in Covid-19 Vaccine were collected for the 50 year period (1971–2020) from Web of Science using the query Covid-19 Vaccine or Coronavirus Vaccine with topic field. Data has been existence from 1971-2020. The complete metadata collected from Web of Science have a total of 7181 records.

DATA ANALYSIS AND INTERPRETATIONS

Geographical wise distribution of Publications

The table 1 presents the country wise output of 7181 publications during 1971-2020 and it found that the country wise collaboration of publications and H-Index. Among the countries "United States" has identified as top rank with 2178(H-Index-114) of documents followed by "China" has reported with 1068 (H-Index-75) of records which ranked at second; the third rank has shared by "India" with 678(H-Index-26) of publications. The study found that 21 Institutions shared more than 100 Publications and the range of H-Index 12-114. It is also found that 139 countries are involving the research in Covid-19 Vaccine.

Table 1: Geographical wise distribution of Publications

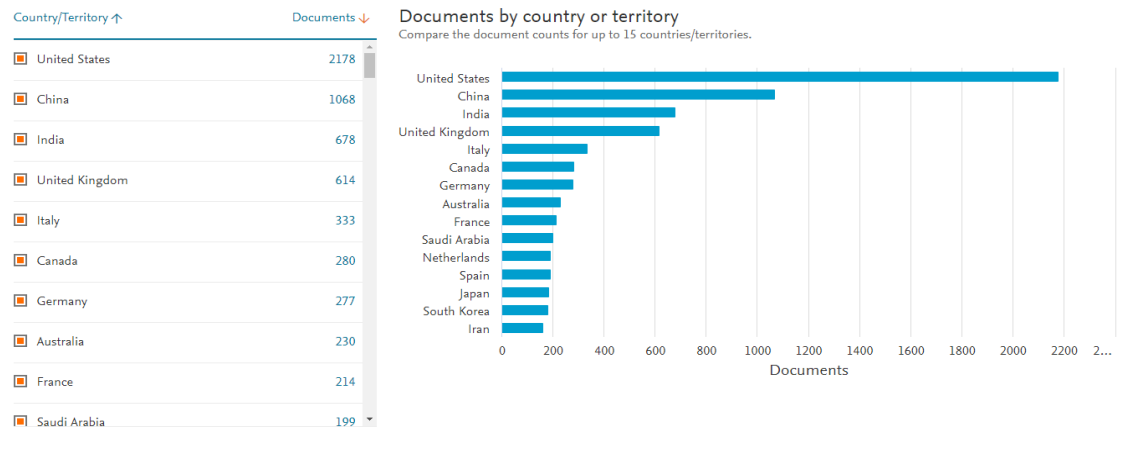| Country	Records	H-Index	Country	Records	H-Index
United States	2178	114	Spain	191	46
China	1068	75	Japan	182	39
India	678	26	South Korea	180	42
United Kingdom	614	53	Iran	162	34
Italy	333	30	Brazil	158	33
Canada	280	41	Switzerland	145	46
Germany	277	40	Hong Kong	140	50
Australia	230	26	Egypt	123	20
France	214	36	Turkey	109	12
Saudi Arabia	199	30	Pakistan	106	13
Netherlands	191	56			

Figure1: Country wise distribution of Publications

Institution wise Distributions

Table 2 presents the top 20 affiliations wise collaboration output of the total 7181 documents during 1971-2020. Among that the "National Institutes of Health NIH has scored 144(H-Index-49) of documents and occupied the first place; "Chinese academy of Sciences" has scored second place with 108(H-Index-31) of publications; "National Institute of Allergy and Infectious Diseases NIAID Scored with 97(H-Index-48) of documents and followed by other institutions in their respective places. The study found that 21 Institutions are shared 20% Publications with minimum of 50 publications each.

Table 2: Institution wise distribution of Publications

Institution	Publications	H-Index
National Institutes of Health NIH	144	49
Chinese Academy of Sciences	108	31
National Institute of Allergy and Infectious Diseases NIAID	97	48
The University of Hong Kong	93	39
Chinese Academy of Agricultural Sciences	90	25
The University of North Carolina at Chapel Hill	89	43
Fudan University	86	33
Harvard Medical School	83	27
Academy of Military Medical Science China	82	41
University of Oxford	75	20
New York Blood Center	72	41
Chinese Academy of Medical Sciences & Peking Union Medical College	69	30
UT Medical Branch at Galveston	66	28
University of Washington, Seattle	64	16
University of Melbourne	58	13
The Ohio State University	55	25
Shanghai Medical College Fudan University	53	30

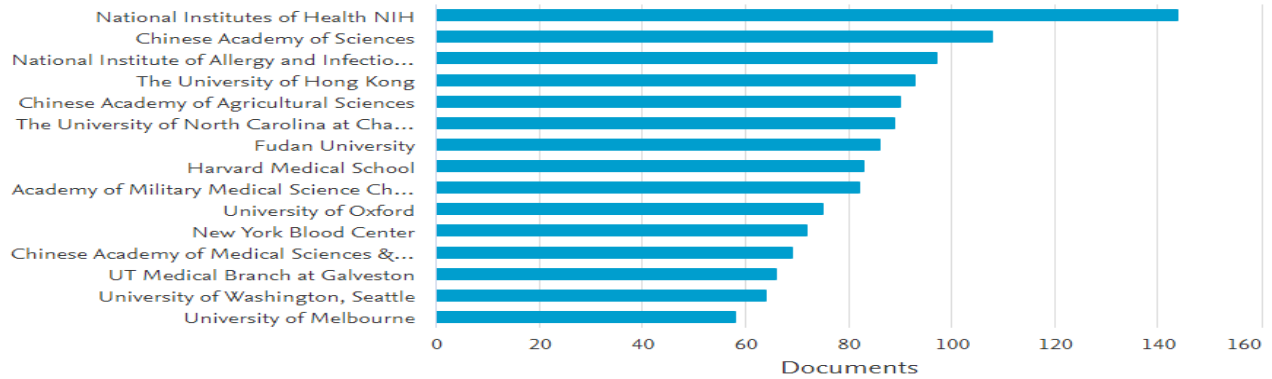|		
Sun Yat-Sen University	52	25
Centers for Disease Control and Prevention	52	24
London School of Hygiene & Tropical Medicine	52	11
Utrecht University	51	31

Figure 2: Institution wise distribution of Publications

Bibliographical form wise distribution of Publications

The table 3 presents the document types wise output of 7181 publications during the study period of 1971 -2020. Among the various types of documents were analyses and resulted 11 items, in which "Article" has scored with 4094 publications and ranked at top; followed by the item "Review" has produced 1730 records and got the second position; the third rank have occupied the item "Note" with 450 documents and the rests are followed by others. The below figure also illustrate by graphically the same.

Table 3: Bibliographical form wise distribution of Publications

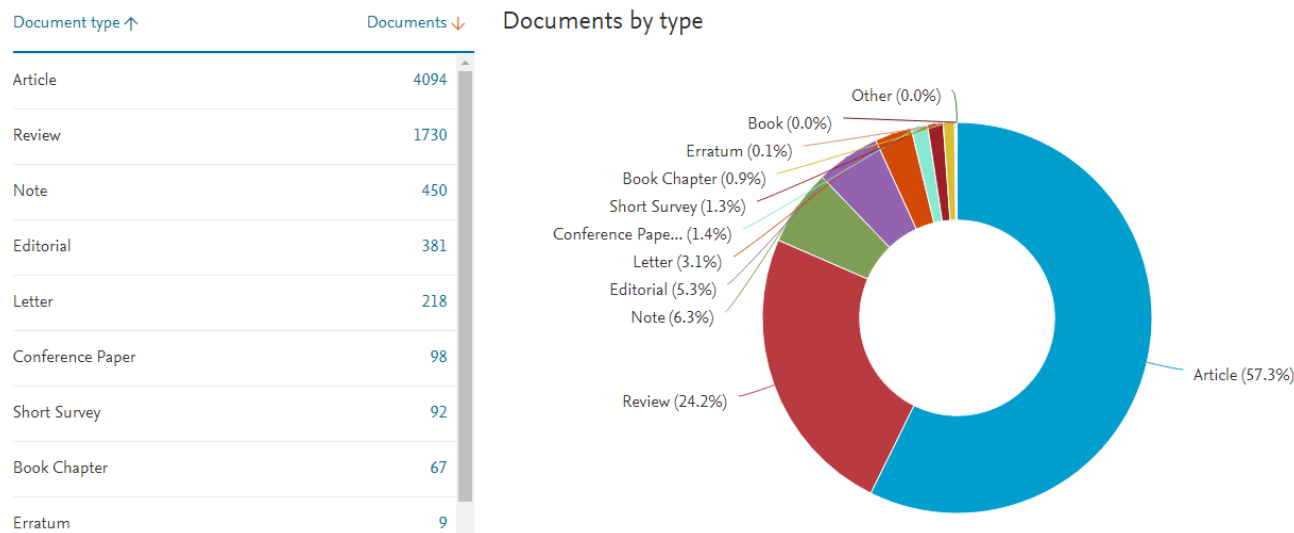| Document Type	Publications
Article	4094
Review	1730
Note	450
Editorial	381
Letter	218
Conference Paper	98
Short Survey	92
Book Chapter	67
Erratum	9
Book	3
Data Paper	2

Figure 3: Bibliographical form wise distribution of Publications

Source Title wise distribution of Publications

Table 4 presents the top source wise output for the study period and found a total of 7181 Publications indexed in difference sources. Among them the "Vaccine" has scored 203(Cite Score value is 5.5, SNIP-1.20 and SJR-1.68) of documents and placed at top; the "Journal of Virology" has occupied the second place with 104 ((Cite Score value is 7.9, SNIP-1.08 and SJR-2.40)) of documents; the "Nature" has occupied the third place with 96(51%) of documents and followed by others in their respective places. The study found that 37 titles covered one fourth of Publications and Lancet identified as high impact source with 73.4 Cite Score Value followed by New England Journal Of Medicine with 66.1, Nature with 51 and Science with 45.3.

Table 4: Source Title wise Publications, Cite Score, SNIP and SJR

Source Title	Publications	Cite Score	SNIP	SJR
Vaccine	203	5.5	1.20	1.68
Journal Of Virology	104	7.9	1.08	2.40
Nature	96	51.0	8.82	14.04
Avian Diseases	91	2.3	0.85	0.58
Science	85	45.3	7.52	13.11
Viruses	75	4.7	1.03	1.08
Human Vaccines And Immunotherapeutics	74	4.3	1.106	1.63
Frontiers In Immunology	72	5.4	1.22	2.11
Journal Of Biomolecular Structure And Dynamics	67	4.5	0.98	0.504
Plos One	66	5.2	1.205	1.023
Virus Research	64	5.3	0.904	1.19
Journal Of Medical Virology	59	4.0	0.78	0.85
Vaccines	59	4.3	1.14	1.74

Lancet	58	73.4	21.31	14.55
Veterinary Microbiology	57	4.7	1.19	1.13
Archives Of Virology	55	4.2	0.99	0.93
JAMA Journal Of The American Medical Association	52	26.3	11.13	5.91
Avian Pathology	47	3.7	1.18	0.805
Virology	44	5.2	0.83	1.26
Proceedings Of The National Academy Of Sciences Of The United States Of America	42	15.7	2.68	5.16
Medical Hypotheses	40	2.2	0.509	0.427
New England Journal Of Medicine	40	66.1	13.21	18.29
Advances In Experimental Medicine And Biology	39	3.0	0.68	0.67
International Journal Of Research In Pharmaceutical Sciences	39	0.2	0.26	0.11
Lancet Infectious Diseases	38	32.4	7.23	9.04
Infection Genetics And Evolution	37	5.0	1.06	1.18
Journal Of General Virology	37	5.9	1.19	1.38
Poultry Science	36	3.5	1.53	0.92
Emerging Microbes And Infections	34	6.9	1.65	2.21
Biochemical And Biophysical Research Communications	33	4.6	0.73	0.96
Virology Journal	33	4.5	0.96	1.04
Antiviral Research	32	7.4	1.108	1.59
Journal Of Infectious Diseases	32	9.0	1.44	2.94
Journal Of Virological Methods	32	3.4	0.736	0.73
Pathogens	32	3.1	1.18	1.21
BMJ	30	6.5	3.99	2.04
Viral Immunology	30	2.9	0.54	0.66

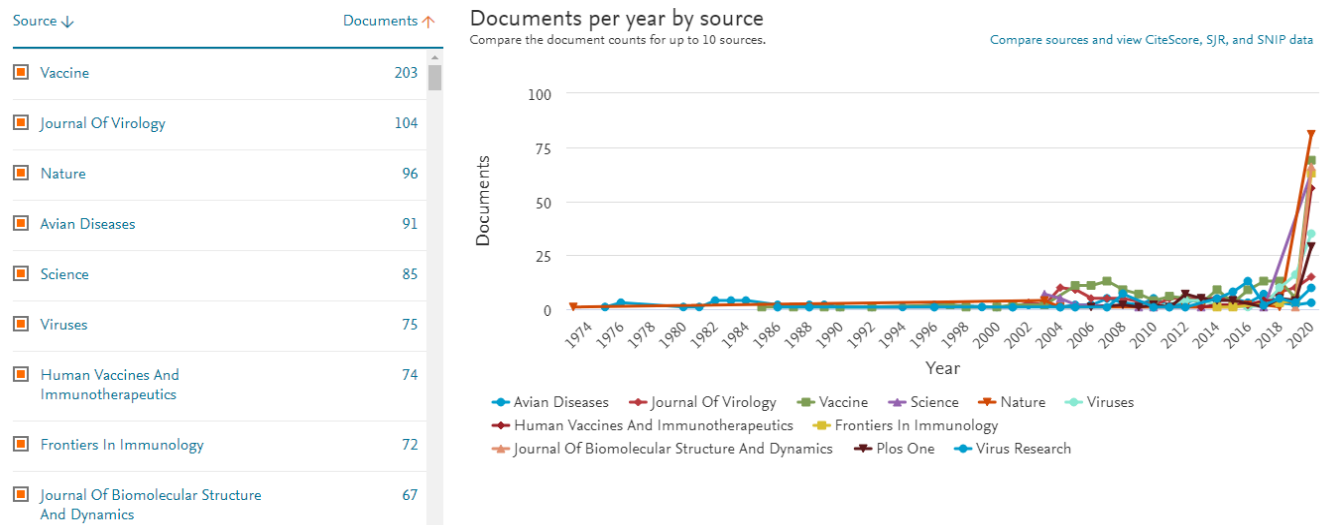| Source ↓	Documents ↑
■ Vaccine	203
■ Journal Of Virology	104
■ Nature	96
■ Avian Diseases	91
■ Science	85
■ Viruses	75
■ Human Vaccines And Immunotherapeutics	74
■ Frontiers In Immunology	72
■ Journal Of Biomolecular Structure And Dynamics	67

Figure 4: Source Title wise Publications, Cite Score, SNIP and SJR

Author wise Distribution of Publications

Table 5 shows that author wise distribution of publications. Author Jiang,s. Contributed a share of 69 publications (overall 16472 citations(H-Index-68); Baric,R.S. shared 56 publications (overall 26253 citations (H-Index-90); Du,L. contribute 56 publications; followed by Enjuanes, L. contribute 43 publications (overall all 9780 citations) and followed by others in their respective places. The study found that 98 authors recorded that minimum of 10 Publications.

Table 5: Author wise Distribution of Publications

Author	Publications	Citations	H-Index	Co-Authors	Citing Articles (References
Jiang, S.	69	16472	68	1249	8813
Baric, R.S.	56	26253	90	1875	14431
Du, L.	56	5857	45	326	3251
Enjuanes, L.	43	9780	57	486	5328
Perlman, S.	40	15174	62	766	9497
Saif, L.J.	39	16537	63	743	7906
Zhou, Y.	35	6124	37	1059	4753
Dhama, K.	34	4723	39	475	2855
Subbarao, K.	33	20448	72	976	12932
He, Y.	27	6179	38	367	4030
Toro, H.	26	1397	23	121	882
Britton, P.	22	3699	35	197	2059
Han, Z.	22	1599	24	139	812
Qin, C.	22	9310	49	1498	7762
Tiwari, R.	22	3539	32	308	2859
Liu, S.	21	1295	21	171	768
Tseng, C.T.K.	21	3410	35	281	2334
Graham, B.S.	20	25636	91	2374	14875
Malik, Y.S.	20	2044	25	436	1639
Memish, Z.A.	20	74678	94	7958	57696
Menachery, V.D.	20	2893	27	369	2212
Roberts, A.	20	4156	32	162	2202
Zhao, J.	20	3436	32	619	2448
Haagmans, B.L.	19	14518	60	1127	9953
Hotez, P.J.	19	64864	86	4317	47432
Jackwood, M.W.	19	3687	34	189	2054
Yuen, K.Y.	19	67967	110	2507	41789
Denison, M.R.	18	6975	43	440	4057
Lu, L.	18	3513	32	384	2284
Zhao, G.	18	2492	30	278	1657
Al-Tawfiq, J.A.	17	7473	43	484	4771
Kong, X.	17	2426	27	343	1580
McLellan, J.S.	17	8030	47	875	5059

Documents by author
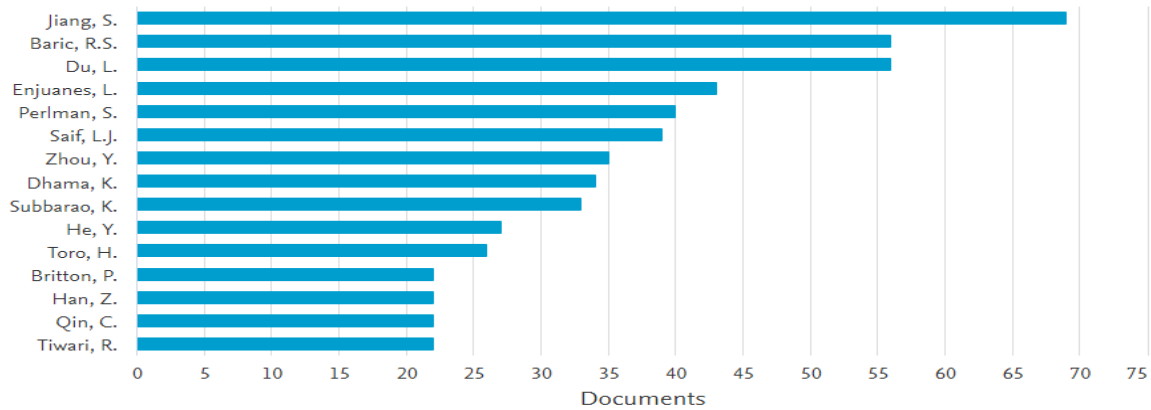Compare the document counts for up to 15 authors.

Figure 5: Author wise Distribution of Publications

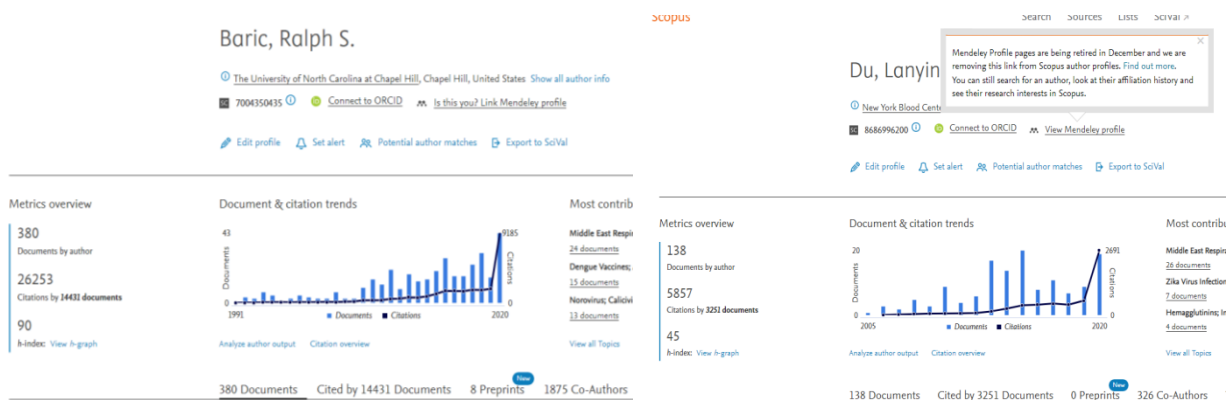Figure 6: Citation Profile of Jiang, Shibo

Figure 7: Citation Profile of Baric, Ralph S. and Du, Lanyin

Year wise distribution of Publication

Table 6 shows the year wise distributions of publication. The study based on total 50 years the total output of 7181 publications which indexed have analyses and resulted, the year 2020

ranked at top with 4402 records; the year 2019 the second rank with 200 records; the year 2004 the third rank with 187 records; followed by the years and ranked their respective places.

Table 6: Year wise distribution of Publication

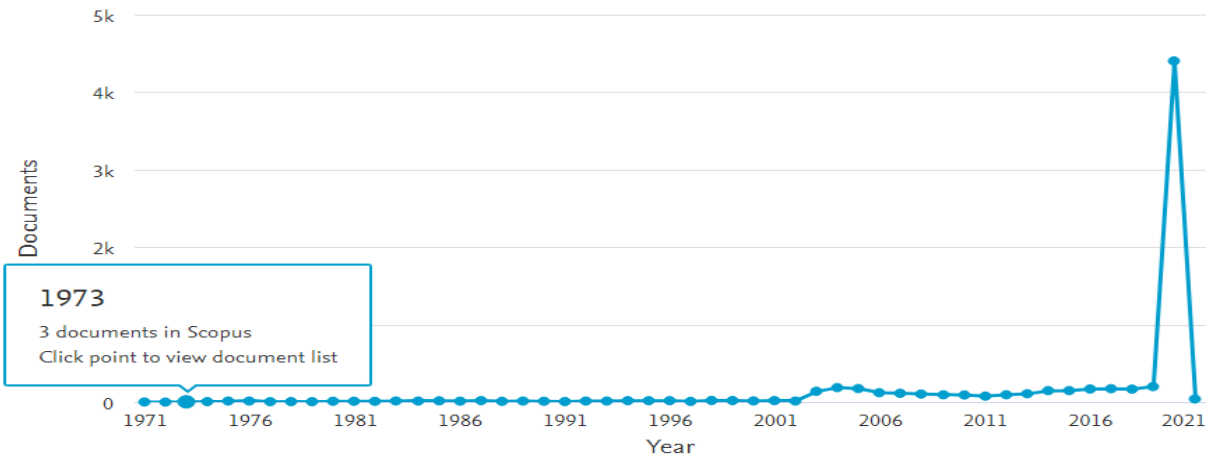| Year	Publications	Year	Publications
2020	4402	1984	19
2019	200	1996	18
2004	187	1995	18
2017	173	1994	18
2005	172	1985	16
2016	169	2000	15
2018	167	1993	14
2015	148	1989	14
2014	145	1983	14
2003	139	1992	12
2006	122	1986	12
2007	113	1990	11
2013	106	1981	11
2008	104	1980	11
2009	96	1988	10
2012	95	1982	10
2010	92	1997	9
2011	77	1975	9
2021	45	1991	7
1998	21	1978	6
1999	20	1974	6
1976	20	1979	5
2002	19	1977	5
2001	19	1973	3
1987	19	1971	1

Figure 8: Year wise distribution of Publication

Language wise distribution of Publications

Language is the essential part of our being. Comprehensively, Language has been vital to academic collaboration, through research movement, research events, and communications, both inside and between organizations themselves. In this way, language wise classification of research output is an important factor for all research fields. The analysis of the publication language revealed that the researchers depend mostly on research material published in English than those in other languages. Table 7 presents the information on types of languages which brought out the research output. From this analysis, 6787 of publications were produced in English language, it dominates in the first place among the all languages, followed by Chinese, German, French, and Russian language publications has been very low. No Indian languages occupies in the analysis, which indicates Indian scientists also priority given to the English language in their research article.

Table 7: Language wise distribution of Publications

Language	Publications	Language	Publications
English	6787	Greek	5
Chinese	115	Korean	5
German	61	Persian	5
French	58	Japanese	4
Spanish	49	Croatian	3
Russian	19	Norwegian	3
Portuguese	15	Swedish	3
Italian	12	Romanian	2
Turkish	8	Bosnian	1
Hungarian	7	Moldavian	1
Polish	7	Moldovan	1
Czech	6	Slovak	1
Dutch	6	Ukrainian	1
Bulgarian	5		

Highly Cited works

Table 8 shows that these 20 papers have recorded as highly cited works during 1971-2020. The highest number of Citations is recorded by Marra, M.A.[a] et al. (2003) with 1460 Citations. The genome sequence of the SARS-associated coronavirus (Open Access)- Science, Volume 300, Issue 5624, 30 May 2003, Pages 1399-1404 followed by Wrapp, D.[a], et al. (2020) Cryo-EM structure of the 2019-nCoV spike in the prefusion conformation, Science, Volume 367, Issue 6483, 13 March 2020, Pages 1260-1263 with 1332. The study found that most of the authors published less number of publications but recorded highest number of Citations and Average

Citations Per Paper. The remaining authors of Citations, Publications and ACPP are displayed in the below table.

Table 8: Highly Cited Works

	Documents	Citations	<2016	2016	2017	2018	2019	2020	Sub total	>2020	Total
	Total		4010	397	391	365	372	6356	7881	95	11986
1	The genome sequence of the SARS-associated coronavirus	2003	1303	16	14	15	16	95	156	1	1460
2	Cryo-EM structure of the 2019-nCoV spike in the prefusion co...	2020						1312	1312	20	1332
3	Structure, Function, and Antigenicity of the SARS-CoV-2 Spik...	2020					1	1108	1109	17	1126
4	Structural biology: Structure of SARS coronavirus spike rece...	2005	243	14	10	15	15	360	414	5	662
5	How will country-based mitigation measures influence the cou...	2020					1	568	569	13	582
6	Viral pneumonia	2011	247	59	61	50	58	80	308	1	556
7	Community-acquired pneumonia requiring hospitalization among...	2015	24	89	114	107	100	107	517		541
8	Angiotensin-converting enzyme 2 (ACE2) as a SARS-CoV-2 recep...	2020						531	531	9	540
9	Severe acute respiratory syndrome	2004	314	24	26	10	9	146	215	1	530
10	Are We Ready for Pandemic Influenza?	2003	412	18	16	13	11	18	76	1	489
11	Coronavirus avian infectious bronchitis virus	2007	194	48	32	48	54	91	273		467
12	Broad-spectrum antiviral GS-5734 inhibits both epidemic and ...	2017			3	17	13	415	448	4	452
13	The spike protein of SARS-CoV - A target for vaccine and the...	2009	78	15	15	8	11	321	370	1	449
14	Characterization of spike glycoprotein of SARS-CoV-2 on viru...	2020					1	432	433	7	440
	A DNA vaccine induces	2004	316	7	7	2	4	84	104		420

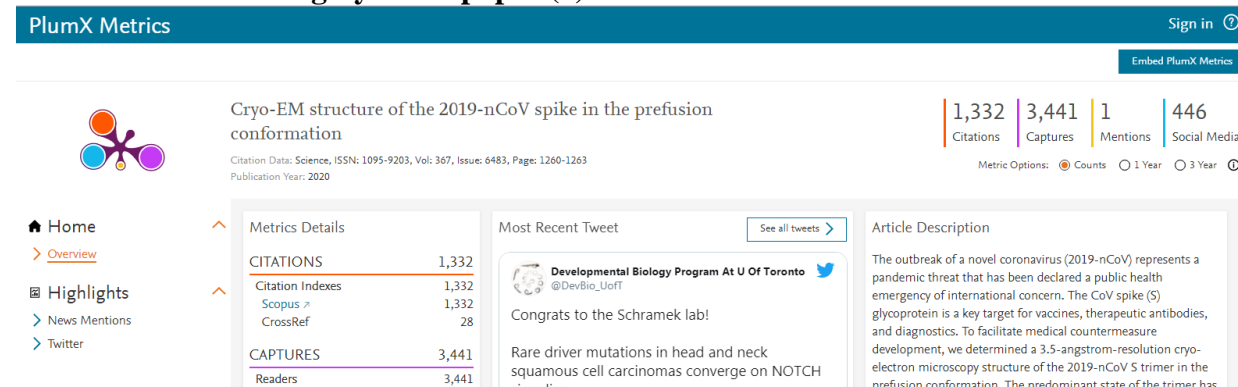|										
15	SARS coronavirus neutralization and pr...									
16	Coronavirus pathogenesis and the emerging pathogen severe ac...	2005	188	14	17	9	13	154	207	2	397
17	COVID-19 infection: Origin, transmission, and characteristic...	2020						383	383	12	395
18	Community-acquired pneumonia	2003	314	18	19	13	14	6	70		384
19	Porcine epidemic diarrhoea virus: A comprehensive review of ...	2012	116	64	51	54	43	55	267		383
20	Potent neutralization of severe acute respiratory syndrome (...	2004	261	11	6	4	8	90	119	1	381

PlumX Metrics for Highly Cited paper (1)

Authors sequenced the 29,751-base genome of the severe acute respiratory syndrome (SARS)-associated coronavirus known as the Tor2 isolate. The genome sequence reveals that this coronavirus is only moderately related to other known coronaviruses, including two human coronaviruses, HCoV-OC43 and HCoV-229E. Phylogenetic analysis of the predicted viral proteins indicates that the virus does not closely resemble any of the three previously known groups of coronaviruses. The genome sequence will aid in the diagnosis of SARS virus infection in humans and potential animal hosts (using polymerase chain reaction and immunological tests), in the development of antivirals (including neutralizing antibodies), and in the identification of putative epitopes for vaccine development.

PlumX Metrics — Sign in

Embed PlumX Metrics

The genome sequence of the SARS-associated coronavirus

Citation Data: Science, ISSN: 0036-8075, Vol: 300, Issue: 5624, Page: 1399-1404
Publication Year: 2003

1,529	1,917	744	19	281
Citations	Usage	Captures	Mentions	Social Media

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Scopus ↗	1,460
CrossRef	967
PubMed Central ↗	380
Patent Family Citations	69
Patent Families	69

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Gem
@kimjeesoung71

It was just a cold.

I laughed a little. 😂

President-elect Sheeple101 @Sheeple101

Article Description

We sequenced the 29,751-base genome of the severe acute respiratory syndrome (SARS)-associated coronavirus known as the Tor2 isolate. The genome sequence reveals that this is only moderately related to other known coronaviruses, including two human coronaviruses, HCoV-OC43 and HCoV-229E. Phylogenetic analysis of the predicted viral proteins indicates that the virus does not closely resemble any of the three previously known groups of coronaviruses. The genome

PlumX Metrics for Highly Cited paper (2)

The outbreak of a novel coronavirus (2019-nCoV) represents a pandemic threat that has been declared a public health emergency of international concern. The CoV spike (S) glycoprotein is a key target for vaccines, therapeutic antibodies, and diagnostics. To facilitate medical countermeasure development, we determined a 3.5-angstrom-resolution cryo-electron microscopy structure of the 2019-nCoV S trimer in the prefusion conformation. The predominant state of the trimer has one of the three receptor-binding domains (RBDs) rotated up in a receptor-accessible conformation. We also provide biophysical and structural evidence that the 2019-nCoV S protein binds angiotensin-converting enzyme 2 (ACE2) with higher affinity than does severe acute respiratory syndrome (SARS)-CoV S. Additionally, we tested several published SARS-CoV RBD-specific monoclonal antibodies and found that they do not have appreciable binding to 2019-nCoV S, suggesting that antibody cross-reactivity may be limited between the two RBDs. The structure of 2019-nCoV S should enable the rapid development and evaluation of medical countermeasures to address the ongoing public health crisis.
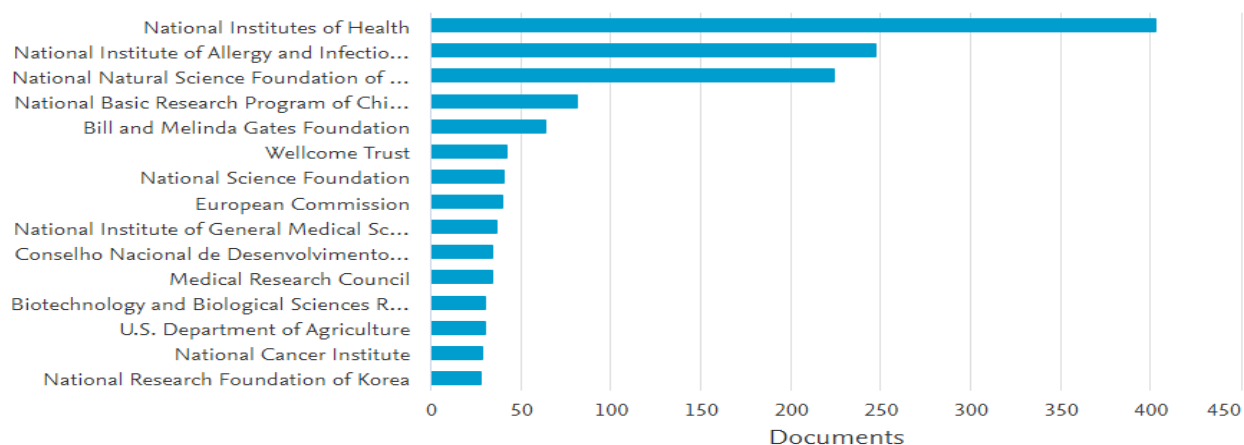

Funding Sponsors

Table 6 shows that the National Institutes of Health leads with 403 publications being featured in the funding agency followed by the National Institute of Allergy and Infectious Diseases with 247 publications, National Natural Science Foundation of China with 224. The study found that 72 funding agencies are recorded the minimum of 10 Publications.

Table 6: Funding Sponsor

Funding Sponsor	Publications
National Institutes of Health	403
National Institute of Allergy and Infectious Diseases	247
National Natural Science Foundation of China	224
National Basic Research Program of China (973 Program)	81
Bill and Melinda Gates Foundation	64
Wellcome Trust	42
National Science Foundation	41
European Commission	40
National Institute of General Medical Sciences	37
Conselho Nacional de Desenvolvimento CientÃfico e TecnolÃ³gico	34
Medical Research Council	34
Biotechnology and Biological Sciences Research Council	30
U.S. Department of Agriculture	30

Figure9: Funding Sponsors

FINDINGS AND CONCLUSION

This article presented a scientometric analysis of research literature on Covid-19 Vaccine. Growth of the published items was clearly observable from the literature output over the years. In 2020 researchers have published 4402 Publications in Covid-19 during Pandemic period with high impact. The study found that the National Institute of Allergy and Infectious Diseases with 247 publications, National Natural Science Foundation of China with 224. The study found that 72 funding agencies are recorded the minimum of 10 Publications. The study found that 37 titles covered one fourth of Publications and Lancet identified as high impact source with 73.4 Cite Score Value followed by New England Journal Of Medicine with 66.1, Nature with 51 and Science with 45.3. It found that the "National Institutes of Health NIH has shared 144(H-Index-49) of documents followed by "Chinese academy of Sciences" with 108(H-Index-31) of publications; The study found that 21 Institutions are shared 20% Publications with minimum of 50 publications each. International research collaboration should be funded and supported. Future research needs to focus on Covid-19 Vaccine.

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