Global Research Output on 'Coronavirus Disease-2019' (COVID-19): A Scientometrics Analysis

S. Ravichandran
Library Assistant Grade-1,
SRM Institute of Science and Technology,
Kattankulathur, Chengalpattu,Tamilnadu,Pin-603203,
Mail:ravichas2@srmist.edu.in

S. Vivekanandhan
Deputy Librarian,
SRM Institute of Science and Technology,
Kattankulathur,ChengalpattuTamilnadu, Pin: 603203,
mail: vivekans@srmist.edu.in

Abstract

*The study focused on the one year (December 2019 – December 2020) research output on COVID-19 worldwide. It indicates that a total number of 50426 papers were published which has received 91017 citations. During period under study.In the year 2019 only a fewer publications appeared on COVID-19 during December 2019 which increased drastically from 2020,55407(99.92%) publications in 2020 till December. It is also notable in table that highest citations 90972(*99.95%) were recorded in the year 2020. ACPP of which was 1.64 and h-index is 96. The Subject-wise distribution of research publications were produced in the field of 'Biochemistry, Genetics and Molecular Biology 6795(66.41%).TA research contribution of top ten countries on the United States is on the first position with 14849(30.65%) publications. The paper by Huang, C. et.al (2020) on Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China was found to be the most highly cited publication with 16790 citations,*

Keywords
COVID-19;Coronavirus 2019,Bibliometric; Research output; COVID Literature.

Electronic access
The journal is available at www.jalis.in

Journal of Advances in Library and Information Science
ISSN: 2277-2219 Vol. 11. No.2. 2022. pp.131-139

Introduction

Coronaviruses (CoVs) are a family of viruses that cause respiratory and intestinal illnesses in humans and animals.[1] They usually cause mild colds in people but the emergence of the severe acute respiratory syndrome (SARS) epidemic in China in 2002–2003 and the Middle East respiratory syndrome (MERS) on the Arabian Peninsula in 2012 show they can also cause severe disease. Since December 2019, the world has been battling another coronavirus. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus responsible for the current outbreak of coronavirus disease (COVID-19), which was first identified in Wuhan, China, following reports of serious pneumonia.[1 & 2]

Coronaviruses are relatively simple structures, and their form helps us to understand how they work. They are spherical and coated with spikes of protein. These spikes help the virus bind to and infect healthy cells. However, the same spikes are also what allow the immune system to 'see' the virus. Bits of the spike can be used in potential coronavirus vaccines to prompt the body to produce antibodies against this new virus. They are named for the distinctive appearance of their spikes; when seen under a powerful microscope, the spikes look like a crown (corona is the Latin for 'crown') [3]. Beneath these spikes is a layer of the membrane. This membrane can be disrupted by detergents and alcohols, which is why soap and water, and alcohol hand sanitizer gels are effective against the virus. Inside the membrane is the virus' genetic material – its genome. Whereas the genomes of some viruses like chickenpox and smallpox are made of DNA like humans, those of coronaviruses are made of the closely-related RNA. RNA viruses have small genomes which are subject to constant change. These changes, called mutations, help the virus adapt to and infect new host species. It is thought that the new COVID-19 likely originated from bats but it is not yet known whether mutations allowed this jump from animals to humans.[4]

The new SARS-CoV-2 is most closely related to a group of SARS-CoVs found in humans, bats, pangolins, and civets. Even though there are many similarities between the new COVID-19 and the virus that caused the SARS epidemic, there are also differences resulting from changes in their genomes. This includes how they are passed from one individual to another, and the different symptoms of coronaviruses. Early reports suggest that the new coronavirus is more contagious than the virus that

caused SARS but less likely to cause severe disease. To date, seven human coronaviruses (HCoVs) have been identified (see table below) [5].

Scientometrics

The applications of quantitative technique to libraries was until recently known as statistical bibliography. It was coined by Hulme (1923).[6.] Alan Prichard (1969)[7] use the term bibliometric in1969 to describe all studies which seek to quantity the press of written communication. He defined bibliometric the application of mathematics and statistical methods to books and other media of communication.Fair throne (1992)[8]definedbibliometric as the quantitative treatment of the properties of recorded discourse and behavior pertaining to it. Potter defined as the study and measurement of the publication and their authors. According to Sengupta (1969)[9]bibliometric is the organization, classification and quantitative evaluations of publications patterns of all macro and micro communications along with their authorship by mathematical and statistical calculus. Schardenlooks upon bibliometric as to science of recorded discourse which uses specific methodologies mathematical and scientific in its research in a controlled study of communication.

Objective of the Study

The main objective of this study is to analyze the research output on COVID-19 produced by different scholars and scientists. The specific objectives are:

- To analyze the year-wise research output on COVID-19.
- To find subjects wise research output on COVID-19.
- To identify the most prolific authors conducted research on COVID-19.
- To study the top sources preferred by authors for publishing COVID-19 research.
- To know the top institutional research output on COVID-19.
- To identify the top countries conducting research on COVID-19.
- To identify the top used keywords in research publications on COVID-19.
- To identify the top used Funding agency and Language in research publications on COVID-19.
- To identify the highly cited paper on COVID-19.

Methodology

Data for the present study has been extracted from World's largest database of peer reviewed literature i.e. Scopus. The study covers data from December 2019 to December 2020 for the Pandemic disease 'Covid-19' spreading worldwide. Data obtained from Scopus on COVID-19 was extracted using key words -COVID-19, Novel Corona virus Disease 2019. Your query: (TITLE-ABS-KEY ("CORONAVIRUS DISEASE-2019") AND PUBYEAR > 2018 AND PUBYEAR < 2021)after exporting data from Scopus database to excel sheet, it was encircled in definite to summarize outputs and place into tabular form. The data was collected on 23.03.2021.

Review of Literature

Surulinathi et.al (2020)[10] Analyzed Research output on Covid-19/Coronavirus Vaccine: A Scientometric Study, 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.. 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).

Senthamilselvi et.al (2020)[11] examined Research output on Coronavirus (Covid-19)/ Hantavirus in India: A Scientometric Study. The research output is based on the Scopus online database during the period 1975-2020. A total of 3498 publications were published and the overall H-Index is 50. All India Institute of Medical Sciences, New Delhi topped the list with 246 publications, the highly productive journals are Diabetes and Metabolic Syndrome Clinical Research and Reviews (Elsevier) with 100 publications (CiteScore-2.6, SJR-0.672, and SNIP-0.982).Patil (2020)[12]analyzed a Scientometric Analysis of Global COVID-19 Research Based on Dimensions Database. The present study analyzed 2184 publications on COVID-19, indexed by Dimensions database during the period of 1st January to 27th March 2020. The study found a multi-authorship trend in the literature of COVID-19. The data reveals China as a highly cited country. The collaboration network of Fudan University, the University of Oxford, and the University of Hong Kong were found to be strong. The list of highly cited references is dominated by two journals i.e. 'The Lancet & 'New England Journal of Medicine. The

study reported coronavirus, pandemic, data, ncov, etc. as the frequently occurred keywords in the COVID-19 publications. Frshid & Somayeh (2020)[13] have studied applied research was carried out using scientometrics methods and an analytical approach. The statistical population of this article includes 5128 Coronavirus subject area documents indexed on the WoS from 1970 to 2019. The keywords were extracted from MeSH and analyzed using Excel 2016. Data analysis showed that the highest science production was in 2005, and the highest citation number was in 2019. "Enjuanes L." is the most proliferated author, the United States, the most productive country, and the University of Hong Kong, the top organization in Coronavirus in the last half-century. Muneer Ahmad &Sadik Batcha (2020)[14] Identifying and Mapping the Global Research Output on Coronavirus Disease: A Scientometric Study. The paper explores and analyses the trend of world literature on "Coronavirus Disease" in terms of the output of research publications as indexed in the Science Citation Index Expanded (SCI-E) of Web of Science during the period from 2011 to 2020. The study found that 6071 research records have been published on Coronavirus Disease till March 2020,

DATA ANALYSIS AND FINDINGS

Year-wise distribution of research literature on COVID 19

Table 1: Year-wise distribution of research literature on COVID 19

S.No	Year	Publications	%	Citations	%	ACPP	h-index
1	2020	55407	99.97	90972	99.95	1.64	96
2	2019	19	0.03	45	0.05	2.37	3
	Total	55426	100.00	91017	100.00	4.01	

Table 1 shows the year-wise distribution of research publications during the period under study. In the year 2019 only a fewer publications appeared on COVID-19 during December 2019 which increased drastically from 19 in 2019 to 55407 publications in 2020 till December. It may be due to as "On 29th Jan WHO declared nCov 2019 as public health emergency of international concern. The disease was christened as COVID 19 by WHO on 11th Feb 2020" 3. It is also notable in table that highest citations (90972) were recorded in the year 2020 whereas in 2019 only 45 citations were credited to 19 papers. The table reflects that in a total period of 6 months of pandemic (Dec 2019-December 2020) a total of 55426 research publications were appeared at global level ACPP of which was 4.01

Subject-wise distribution of Research publications

Table 2: Subject wise publication output

S. No	Subject	Publications	%
1	Agricultural and Biological Sciences	1180	11.53
2	Arts and Humanities	173	1.69
3	Biochemistry, Genetics and Molecular Biology	6795	66.41
4	Business, Management and Accounting	92	0.90
5	Chemical Engineering	438	4.28
6	Chemistry	495	4.84
7	Computer Science	522	5.10
8	Decision Sciences	90	0.88
9	Dentistry	383	3.74
10	Earth and Planetary Sciences	64	0.63
	Total	10232	100.00

Subject-wise distribution of research publications on COVID-19 is clearly depicted in table 2. It is evident that majority of publications on COVID-19 were produced in the field of 'Biochemistry, Genetics and Molecular Biology 6795(66.41%) which was distantly followed by 'Agricultural and Biological Sciences 1180(11.53%). 'Computer Science' contributed 522(5.10%) publicationswhereas Chemistry contributed nearly half of it i.e. 495(4.84%) publications. With a very small gap 'Chemical Engineering' andDentistrycontributed almost similar percentage of publications on the disease i.e. 438(4.28%) and 383(4.84%) respectively. Arts and Humanities 173(1.69%), Business, Management and Accounting 92 (0.90%), Decision Sciences 90(0.88). 'Earth and Planetary Sciencesat 10th position contributed 64(0.64%) papers.

Document Type of Research Publications on COVID-19

Table 3: Document Type of publications on COVID-19

S.No	Document	Publications	%
1	Article	26049	47.00
2	Letter	11056	19.95
3	Review	7280	13.13

4	Note	4998	9.02
5	Editorial	4869	8.78
6	Short Survey	792	1.43
7	Conference Paper	223	0.40
8	Erratum	137	0.25
9	Data Paper	8	0.01
10	Book Chapter	6	0.01
11	Retracted	6	0.01
12	Book	1	0.00
13	Conference Review	1	0.00
	Total	55426	100.00

Nearly half of the research output on Covid-19 was published in the form of articles i.e. 26049(47.00%) followed by letters 11056(19.95%). The next type was the Review7280 (13.13%) followed by Note, editorial, short survey, conference paper, erratum and finally data papers i.e.4998 (9.02%), 4869(8.78%), 792(1.43%), 223(0.40%), 137(0.25%), and 8(0.01%) respectively.

Preferred Journals for Publications on COVID-19

Table 4 Preferred Journals for Publications on COVID-19

S.No	Journals	Publisher	Country	Publications	%
1	BMJ	BMJ Publishing Group	United States	767	15.89
2	International Journal Of Environmental Research And Public Health	Multidisciplinary Digital Publishing InstituteMDPI)	China	700	14.50
3	Plos One	Public Library of Science	United Kingdom	609	12.61
4	Lancet	Elsevier	Italy	534	11.06
5	JAMA Journal Of The American Medical Association	American Medical Association	India	435	9.01
6	Science	American Association for the Advancement of Science	France	398	8.24
7	Journal Of Medical Virology	Wiley-Blackwell	Canada	364	7.54
8	International Journal Of Infectious Diseases	Elsevier	Germany	349	7.23
9	New England Journal Of Medicine	Massachusetts Medical Society	Spain	340	7.04
10	Medical Hypotheses	Elsevier	Australia	332	6.88
	Total			4828	100.00

Top ten sources preferred for publications on COVID-19 are listed in table 4. These ten sources published nearly 4828 publications during six months. It is very apparent from table 4 that BMJhas published maximum articles i.e. 767(15.89%), followed by International Journal of Environmental Research and Public Health 700 (14.50%). A very small gap was there inPlos One and Lancet regarding the publications i.e. 609(12.61%)&534(11.06%) respectively followed by JAMA Journal of the American Medical Association 435(9.01%). Medical Hypothesesat 10th position published 332(6.88%). It is also found that publications on COVID-19b. It is notable that majority of the journals belongs to medicinal and disease and perfectly matches with COVID-19 disease.

Institutional Contribution on COVID-19

Table 5 Institutional Contribution on COVID-19

S.No	Institutions	Country	Publications	%
1	Harvard Medical School	United States	1159	15.65
2	Huazhong University of Science and Technology	China	977	13.19
3	Tongji Medical College	United Kingdom	951	12.84
4	Inserm	Italy	788	10.64

5	University of Toronto	India	716	9.67
6	UniversitàdegliStudi di Milano	France	637	8.60
7	Massachusetts General Hospital	Canada	569	7.68
8	UniversitàdegliStudi di Roma La Sapienza	Germany	567	7.65
9	Icahn School of Medicine at Mount Sinai	Spain	522	7.05
10	AP-HP Assistance Publique - Hopitaux de Paris	Australia	521	7.03
	Total		7407	100.00

Top ten institutions that highest research publications on COVID-19 during the period under study are listed in table 5. These top institutions collectively contributed 1159(15.65%) publications on COVID-19. Highest numbers of publications among top ten institutes were contributed by Huazhong University of Science and Technology 977 (13.19%) and Tongji Medical College 951(12.84%)Publications University at 10th position viz. AP-HP Assistance Publique - Hopitaux de Paris, contributed 521(7.03%) publications.

Hence it can be concluded that worldwide universities have participated for providing the literature on this pandemic disease COVID-19.

Most Prolific Authors Publications on COVID-19

Table: 6 Top prolific authors Publications on COVID-19

S.No	Author	Affiliations	Countrty	TP	%	TC	%	h-index
1	Wiwanitkit, V.	Harvard Medical School	United States	121	20.65	562	1.90	12
2	Lippi, G.	Huazhong University of Science and Technology	China	78	13.31	4390	14.86	28
3	Dhama, K.	Tongji Medical College	United Kingdom	68	11.60	1758	5.95	16
4	Yuen, K.Y.	Inserm	Italy	52	8.87	16747	56.69	25
5	Rodriguez-Morales, A.J.	University of Toronto	India	50	8.53	1797	6.08	18
6	Horton, R.	UniversitàdegliStudi di Milano	France	45	7.68	271	0.92	9
7	Goldust, M.	Massachusetts General Hospital	Canada	44	7.51	312	1.06	9
8	Henry, B.M.	UniversitàdegliStudi di Roma La Sapienza	Germany	44	7.51	2140	7.24	20
9	Baden, L.R.	Icahn School of Medicine at Mount Sinai	Spain	42	7.17	331	1.12	7
10	The Lancet	AP-HP Assistance Publique - Hopitaux de Paris	Australia	42	7.17	1232	4.17	13
	Total			586	100	29540	100	

TP – Total Publications, TC - Total Citations

The list of top seven authors who produced highest contribution to research output on COVID-19 s listed in Table 6. These top seven authors collectively published 458 papers on COVID-19. In terms of publications, Wiwanitkit, V. contributed maximum i.e. 121 papers followed by Lippi, G. (78) and Dhama, K. (68) respectively. Four authors have contributed exactly same number of publications i.e. 44 and 42 each for COVID-19. On the other hand, Yuen, K.Y. contributed 52 publications. Lippi, G had higher H –index i.e28 followed by Yuen, K.Y. (25). And Henry, B.M.(20).

Top Countries Research Publications on COVID-19

Table: 7 Top ten countries research Publications on COVID-19

S.No	Country	Publications	%
1	United States	14849	30.65
2	China	7241	14.94
3	United Kingdom	5922	12.22
4	Italy	5801	11.97
5	India	3608	7.45
6	France	2384	4.92
7	Canada	2354	4.86
8	Germany	2257	4.66

9	Spain	2166	4.47
10	Australia	1872	3.86
	Total	48454	100.00

A research contribution of top ten countries on COVID-19 is mentioned in Table.7 United States is on the first position with 14849(30.65%) publications followed by China, United Kingdom and Italy in publications regarding COVID-19 and the corresponding values were 7241(14.94%) , 5922(12.22%) ,5801(11.97%) respectively. India's share of contribution is at fifth Position with 3608(7.45%) publications to its credit. Five countries France, Canada, Germany, Spain and Australia have contributed more 3 to 4 percent output on COVID. Hence it can be concluded that U.S., China, Italy, U.K. and India were more active countries in terms of publishing on COVID-19.

Most Preferred Keywords used for Research on COVID

Table 8: Top 10 keywords used in publications on COVID-19

S.No	Keyword	Publications	%
1	Human	51348	14.35
2	Coronavirus Disease 2019	50813	14.20
3	Pandemic	39750	11.11
4	Humans	37100	10.37
5	Pandemics	32254	9.01
6	Virus Pneumonia	30634	8.56
7	Coronavirus Infection	30390	8.49
8	Coronavirus Infections	30095	8.41
9	Pneumonia, Viral	29872	8.35
10	Beta coronavirus	25595	7.15
	Total	357851	100.00

The most popular keywords that appeared in research publications on COVID-19 during period of six months are listed in table 8. The top ten keywords were appeared 357851 times in total publications published during the period under study. Human and coronavirus Disease 2019 i.e. in 51348(14.35), and 50813(14.20) papers respectively. On the other hand two terms Pandemic and coronavirus Infection used in similar number of papers i.e. 39750(11.11%) and 30390(8.49%) respectively. Three related terms Humans, Virus Pneumonia, corona virus Infections, Pneumonia, viral and Beta coronavirusused in similar percentage i.e. 10.37%, 8.56%, 8.41%, 8.31% and 7.15% respectively. Another six terms Pandemics,Priority Journal and SARS-CoV-2 were also used in publications and the corresponding number was 9.01% respectively. Hence it can be said that keyword COVID-19 is popularly used in most of the papers globally.

Most Preferred Funding agency used for Research on COVID

Table 9: Top 10Funding agency used in publications on COVID-19

S. No	Funding agency	Publi cations	%
1	National Natural Science Foundation of China	1446	29.37
2	National Institutes of Health	1427	28.99
3	National Institute for Health Research	381	7.74
4	National Institute of Allergy and Infectious Diseases	323	6.56
5	Wellcome Trust	282	5.73
6	National Heart, Lung, and Blood Institute	230	4.67
7	Pfizer	226	4.59
8	Novartis	216	4.39
9	Medical Research Council	198	4.02
10	National Science Foundation	194	3.94
	Total	4923	100.00

A research contribution of top tenFunding agency on COVID-19 is mentioned in Table9 National Natural Science Foundation of Chinais on the first position with 1446(29.37%) publications followed by National Institutes of Health,National Institute for Health Research andNational Institute of Allergy and Infectious Diseases in publications regarding COVID-19 and the corresponding values were 1427(28.99), 381(7.74%), 323(6.56%) respectively.

Most Preferred Languages used for Research on COVID

Table 10: Top 10 Languages used in publications on COVID-19

S.No	Language	Publications	%
1	English	52099	92.84
2	Spanish	999	1.78
3	Chinese	865	1.54
4	German	748	1.33
5	French	715	1.27
6	Russian	238	0.42

7	Portuguese	178	0.32
8	Italian	124	0.22
9	Dutch	114	0.20
10	Turkish	37	0.07
	Total	56117	100.00

A research contribution of top ten languages on COVID-19 is mentioned in Table.8 English is on the first position with 52099(92.84%) publications followed by Spanish, Chines and German in publications regarding COVID-19 and the corresponding values were 999(1.78%), 865(1.54%),748(1.33%) respectively.

Highly cited Articles

Table 11: Highly Cited Articles

Total Authors	Titles	Citations	Document Type
28	Huang, C. et.al (2020)Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China, The Lancet, 395(10223):497-506.	16790	Article
36	Guan, W. et.al (2020) Clinical characteristics of coronavirus disease 2019 in China, New England Journal of Medicine, 382(18):1708-1720.	11084	Article
18	Wang, D., et.al (2020)Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China, JAMA - Journal of the American Medical Association, 395(10229):1054-1062.	9557	Article
17	Zhou, F., et.al (2020) Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study, The Lancet, 382(8):727-733.	9259	Article
13	Zhu, N., et.al (2020) A novel coronavirus from patients with pneumonia in China, 2019, New England Journal of Medicine, 323(11):1061-1069.	9183	Article
13	Chen, N. et.al (2020) Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study, The Lancet, 395(10223):507-513.	8028	Article
28	Zhou, P. et.al (2020) A pneumonia outbreak associated with a new coronavirus of probable bat origin, Nature, 579(7798):270-273.	7093	Article
2	Wu, Z. &McGoogan J.M. (2020)Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases from the Chinese Center for Disease Control and Prevention, JAMA - Journal of the American Medical Association, 323(13):1239-1242.	6527	Note
44	Li, Q., et.al (2020)Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia, New England Journal of Medicine, 382(13):1199-1207.	5971	Review
12	Hoffmann, M. et.al (2020) SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor, Cell, 181(2):271-283.	5726	Review

The paper by Huang, C. et.al on Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China was found to be the most highly cited publication with 16790 citations, followed by Second cited paper Guan, W. et.al Clinical characteristics of coronavirus disease 2019 in China, New England Journal of Medicine, highly cited publication with 11084 citations. Third cited paper Wang, D., et.al Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China highly cited publication with 9557 citations.

Finding and Conclusions

The study focused on the one year (December 2019 – December 2020) research output on COVID-19 worldwide. It indicates that a total number of 50426 papers were published which has received 91017 citations during period under study.

- The Year-wise distribution of research publications during the period under study. In the year 2019 only a fewer publications appeared on COVID-19 during December 2019 which increased drastically from 19 in 2019 to 55407 publications in 2020 till

December. It is also notable in table that highest citations (90972) were recorded in the year 2020 whereas in 2019 only 45 citations were credited to 19 papers. a total of 55426 research publications were appeared at global level ACPP of which was 4.01

- During the Subject-wise distribution of research publications on COVID-19 is clearly depicted. It is evident that majority of publications on COVID-19 were produced in the field of 'Biochemistry, Genetics and Molecular Biology 6795(66.41%) which was distantly followed by 'Agricultural and Biological Sciences 1180(11.53%). 'Computer Science' contributed 522(5.10%) publications.
- Nearly half of the research output on Covid-19 was published in the form of articles i.e. 26049(47.00%) followed by letters 11056(19.95%). The next type was the Review7280 (13.13).
- During the top ten sources preferred for publications on COVID-19 are ten sources published nearly 4828 publications during six months. BMJ has published maximum articles i.e. 767(15.89%), followed by International Journal of Environmental Research and Public Health 700 (14.50%).
- During the highest numbers of publications among top ten institutes were contributed by Huazhong University of Science and Technology 977 (13.19%) and Tongji Medical College 951(12.84%) Publications University.
- The list of top seven authors who produced highest contribution to research output on COVID-19 s listed in the top seven authors collectively published 458 papers on COVID-19. In terms of publications, Wiwanitkit, V. contributed maximum i.e. 121 papers followed by Lippi, G. (78) and Dhama, K. (68) respectively.
- A research contribution of top ten countries on the United States is on the first position with 14849(30.65%) publications followed by China, United Kingdom and Italy in publications regarding COVID-19 and the corresponding values were 7241(14.94%) , 5922(12.22%) ,5801(11.97%) respectively. India's share of contribution is at fifth Position with 3608 (7.45%) publications to its credit.
- The most popular keywords that appeared in research publications, Human and coronavirus Disease 2019 i.e. in 51348(14.35), and 50813(14.20) papers respectively. On the other hand two terms Pandemic and coronavirus Infection used in similar number of papers i.e. 39750(11.11%) and 30390(8.49%) respectively.
- A research contribution of top ten Funding agency the National Natural Science Foundation of China is on the first position with 1446(29.37%) publications followed by National Institutes of Health, National Institute for Health Research and National Institute of Allergy and Infectious Diseases in publications regarding.
- A research contribution of top ten languages an English is on the first position with 52099(92.84%) publications followed by Spanish, Chines and German in publications regarding COVID-19 and the corresponding values were 999(1.78%), 865(1.54%), 748(1.33%) respectively.
- The paper by Huang, C. et.al (2020) on Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China was found to be the most highly cited publication with 16790 citations, followed by Second cited paper Guan, W. et.al (2020) Clinical characteristics of coronavirus disease 2019 in China, New England Journal of Medicine, highly cited publication with 11084 citations. Third cited paper Wang, D., et.al (2020) Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China highly cited publication with 9557 citations.

References

[1.] Cui J, Li F, Shi ZL (2019).Origin and evolution of pathogenic coronaviruses. *Nature Reviews Microbiology*; 17(3):181-192.

[2.] Wu F, Zhao S, Yu B, et.al (2020)A *Nature*; 579(7798):265-269.

[3.] Zhou P, Yang XL, Wang XG, and et al (2020).A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*, 579(7798):270-273.

[4.] Andersen KG, Rambaut A, Lipkin WI, Holmes EC, Garry RF.(2020)The proximal origin of SARS-CoV-2. *Nature Medicine*, 26(4):450-452.

[5.] Corman VM, Muth D, Niemeyer D, Drosten C.(2018)Hosts and Sources of Endemic

Human Coronaviruses. *Advances in Virus Research*. 8; (100):163-188.

[6.] Hulme, E. Wyndham(1923). Statistical Bibliography in Relation to the Growth of Modern Civilization: Two Lectures Delivered in the University of Cambridge in May, 1922. London: *Grafton & Co*.

[7.] Pritchard, A. (1969). Statistical bibliography or bibliometric, *Journal of Documentation*, 24: 348–9. .

[8.] Sengupta I. N. (1992),Bibliometric, informatics, scientometric and librametric: an overview, *Libri*,42: 75–98.

[9.] Fair throne, R. A. (1969), Empirical hyperbolic distributions (Bradford-Zipf-Mandelbrot) for bibliometricdescription and prediction, *Journal of Documentation*, 25: 319–343

[10.] Surulinathi et.al (2020) Research output on Covid-19/Coronavirus Vaccine: A Scientometric Study, *Library Philosophy and Practice (e-journal)*. 4781: 1-16.

[11.] Senthamilselvi et.al (2020) Research output on Coronavirus (Covid-19)/ Hantavirus in India: A Scientometric Study, *Library Philosophy and Practice (e-journal)*. 4539.1-34

[12.] Patil (2020) A Scientometric Analysis of Global COVID-19 Research Based on Dimensions Database, *Journal of social science research network*, 1-15.

[13.] Frshid& Somayeh (2020) Coronavirus: Scientometrics of 50 Years of Global Scientific Productions, *Iranian journal of medical microbiology*, 14(1): 1-16.

[14.] Muneer Ahmad & Sadik Batcha (2020) Identifying and Mapping the Global Research Output on Coronavirus Disease: A Scientometric Study, *Library Philosophy and Practice (e-journal)*. 4125:1-20.