

Coronavirus: Scientometrics of 50 Years of Global Scientific Productions

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ABSTRACT

Background: Scientometrics studies are one of the most efficient methods of quantitative evaluation of the scientific outputs of valuable information and citation databases for understanding and observing the status of scientific publications in different subject areas. The main aim of this article was to study the 50 years of Coronavirus scientific publications in the world.

Materials & Methods: This 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.

Results: 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.

Conclusion: The results showed, there is a direct relationship between the Coronavirus outbreaks and the amount of Scientific Publications in this area in the World. The quality of the researchers' productions in this area can be deliberated by scientific methods and researchers' self-citation has affected their h-index. For health care researchers, policymakers, and planners, it is necessary to be aware of the results of scientific studies of strategic and vital research areas, such as Coronavirus, to identify more appropriate therapeutic goals, make better decisions, and provide more effective solutions in the shortest time.

Keywords: Coronavirus; COVID-19; 2019-nCoV; Coronavirus Disease 2019; Scientometrics

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Introduction

Coronavirus is a common disease between humans and animals (zoonosis) (1, 2), which is enveloped, non-segmented, and has positive-sense single-stranded RNA virus (3). Genotypically and serologically, there are four groups, with approximately thirty types of coronaviruses common to humans, mammals, and birds. So far, considerable attention has paid to international cases of Pathogenesis and pathology (5-7). COVID-19 identified

by WHO in Wuhan, China, at the beginning of 2020 (6, 5, 2), is considered the most dangerous virus of this family these days and has raised severe health concerns for all countries of the world (13). The virus causes severe respiratory and intestinal infections in animals and humans (14) and subsequently leads to death (15).

With the increase of scientific publications, the importance of observing such studies has become more

critical in assessing the effects of scientific output on the medical sciences and has become an integral part of monitoring the performance of organizations (20). Investigating the existing capacities helps policymakers and research managers in the ranking of performance quality assessment, correct and normative budget allocation (21).

Scientometrics studies in international citation databases such as WOS are one of the essential tools for observing medical research processes and developments (22). Now (March 2020), in line with the challenging and global spread of Coronavirus, medical scientists do many types of research and publish papers to find innovative solutions to prevent the virus. To this end, medical scientists, using various indexes and software to analyze Coronavirus, observe and evaluate research outputs and present their findings to science and technology researchers and policymakers.

Some of the most essential literatures related to scientific representation of medical sciences utilizing scientometrics methods and indicators in Iran and internationally include Coronaviruses bibliographic analysis (14), Nipah Virus (23), MERS-CoV (24), HPV (25), Parasitology (26), Diabetes (27), Surgery (28), Neonatal Health (29).

A review of the literature indicates that different scientometrics tools have attracted the attention of medical scholars and have been useful in representing the structure of medical science knowledge by analyzing this method. Given the immense and strategic importance of Coronavirus and the increasing scientific publicity of this subject, the study of scientometrics of Coronavirus is of great importance.

The main issue of this paper is to determine the status of the knowledge structure of international Coronavirus research outputs. Representing the scientific structure from different angles will guide Coronavirus specialists and researchers and policymakers in the Ministry of Health and medical science associations. Based on the elaborated theoretical framework, the primary purpose

of this paper was to analyze half a century of scientific publications of Coronavirus in the world using scientific methods and tools. It is essential to review the process of scientific publishing, the type of resources, citations to articles, and identify the top journals, researchers, countries, and organizations in this subject area to achieve this goal from 1970 to 2019.

Materials and Methods

This 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 the Mesh browser and analyzed using Excel 2016 software.

Results

Coronavirus international publication trend

Data analysis showed that the highest percentage of the scientific output of Coronavirus was in 2005 (6.8%), 2004 (6.78%), and 2006 (5.92%), respectively (Figure1).

Different Source Types of Coronavirus Scientific Publications Frequency Distribution

This article aimed to review the scientific publications of the Coronavirus, which are in the four types of Articles (4474), Meeting abstracts (313), Proceedings paper (290), and Reviews (235) respectively (Figure 2).

Coronavirus Citation Analysis

The total number of citations received in the last 50 years of the Coronavirus scientific publications is 165451. There are 3271 self-citations at the same time. Coronavirus scientific output in 2019 received the highest number of citations, 11385. The highest self-citation was in 357 in 2014.

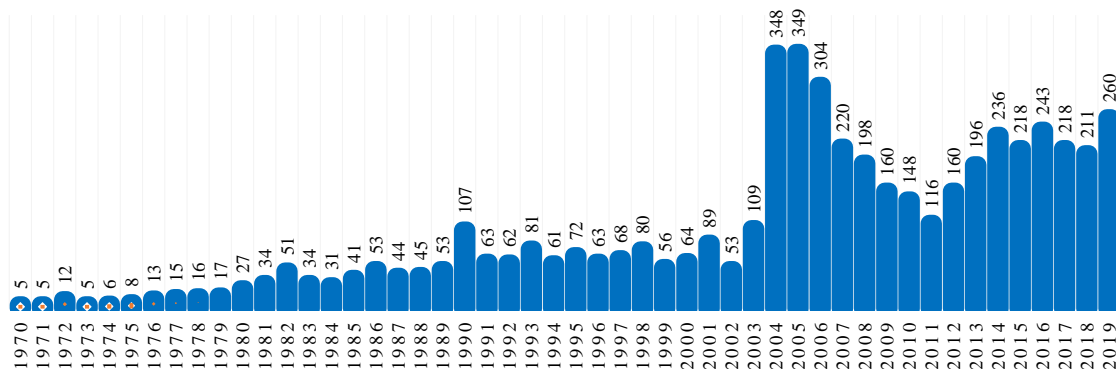


Figure 1. Percentile of Coronavirus science production trend (1970-2019)

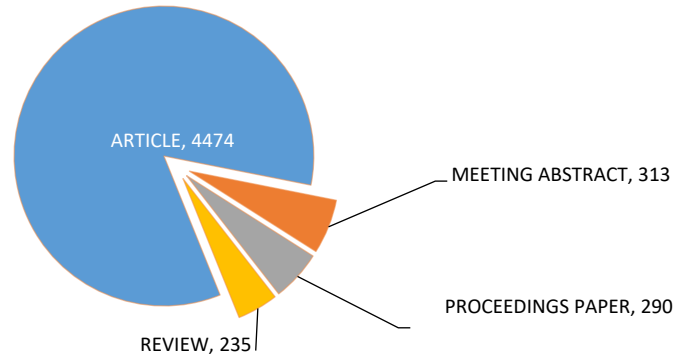


Figure 2. Different Source Types of Coronavirus Scientific Publications (1970-2019)

Table 1. Coronavirus Citation Analysis (1970-2019)

Year	Sum of Times Cited	Citations without Self-Citations	Citation	Self-Citation	% Self-Citation Per (of 3271) Year	Year	Sum of Times Cited	Citations without Self-Citations	Citation	Self-Citation	% Self-Citation Per (of 3271) Year
1970	252	251	1	1	0.000306	1995	2003	1994	1505	9	0.002751
1971	143	143	8	0	0	1996	8	0	1340	8	0.002446
1972	704	701	38	3	0.000917	1997	413	389	1778	24	0.007337
1973	384	383	55	1	0.000306	1998	41	389	1639	9	0.002751
1974	255	0	58	255	0.077958	1999	98	87	1666	11	0.003363
1975	197	0	67	197	0.060226	2000	415	397	1631	18	0.005503
1976	431	429	70	2	0.000611	2001	85	64	2083	21	0.00642
1977	500	497	98	3	0.000917	2002	57	44	1373	13	0.003974
1978	393	391	200	2	0.000611	2003	753	527	2733	226	0.069092
1979	1	0	215	1	0.000306	2004	675	365	5968	310	0.094772
1980	3	0	250	3	0.000917	2005	16050	15758	8876	292	0.089269
1981	4	0	387	4	0.001223	2006	751	634	8811	117	0.035769
1982	1001	994	527	7	0.00214	2007	180	81	8059	99	0.030266
1983	1329	1315	385	14	0.00428	2008	253	184	8986	69	0.021094
1984	1204	1201	404	3	0.000917	2009	444	388	6905	56	0.01712
1985	4	0	504	4	0.001223	2010	661	616	7404	45	0.013757
1986	7	0	518	7	0.00214	2011	898	865	6381	33	0.010089
1987	263	248	672	15	0.004586	2012	566	510	6075	56	0.01712
1988	94	88	819	6	0.001834	2013	9202	8866	7654	336	0.102721
1989	141	136	802	5	0.001529	2014	630	273	10586	357	0.109141
1990	165	146	1107	19	0.005809	2015	157	14	10151	143	0.043718
1991	612	592	1189	20	0.006114	2016	370	256	11068	114	0.034852
1992	173	161	1284	12	0.003669	2017	910	810	9260	100	0.030572
1993	818	808	1842	10	0.003057	2018	1059	989	9243	70	0.0214
1994	958	936	1391	22	0.006726	2019	345	226	11385	119	0.03638
Sum of Self- Citations: 3271											
Sum of received Citations:165451											

Coronavirus Top Journals

Table 2 contains data from the top 10 Coronavirus journals ranked by impact factor. Of the journals listed in Table 2, the US publishes 12 and the Netherlands 5 Coronavirus journals. The highest impact factor is 9.58. The Journal of Virology has the highest number of citations and self-citations with 37309 and 5734, respectively.

Top Coronavirus Researchers

Table 3 lists the top ten Coronavirus researchers based on the number of scientific publications in the last 50 years. "Enjuanes, L." with 114 publications, has the first place. However, the highest h-index belongs to "Yuen, KY" which is 49. It should be noted that "Yuen, KY" has 862 has the self-citation; which is the highest. Of the 5,128 Coronavirus documents in the

last 50 years, 888 (over 17%) were published by the top 10 researchers.

The Most Proliferated Countries in Coronavirus

Of the 98 countries that have published the most Coronavirus scientific papers, the United States, China, and the Netherlands are the most proliferated countries (Figure 3).

The Most Proliferated Organizations in Coronavirus

Among the most proliferated organizations in Coronavirus scientific publications, The University of Hong Kong, Chinese Academy of Sciences, and Utrecht University have ranked first to third, respectively.

Table 2. Ranking of **Coronavirus Journals** based on Impact Factor (1970-2019)

Resource Title	Citations	Pure Citations	Self-Citation	Country	Article Influence Score	Eigen Factor	Impact factor (IF)	Quartile (Q)
Proceedings of the National Academy of Sciences of the United States of America	6403	6324	79	USA	4.493	1.02189	9.58	Q1
Emerging infectious diseases	4182	4094	88	USA	2.725	0.05940	7.185	Q1
Journal of Infectious Disease	2939	2889	50	USA	2.164	0.07596	5.045	Q1
Journal of Clinical Microbiology	2384	2329	55	USA	1.381	0.05332	4.959	Q1
Journal of Virology	37309	31575	5734	USA	1.381	0.09997	4.324	Q1
Antiviral Research	882	865	17	Netherlands	1.137	0.01597	4.13	Q1
The Journal of Biological Chemistry	2971	2916	55	USA	1.503	0.25223	4.106	Q2
Viruses Basel	888	863	25	Switzerland	1.221	0.02409	3.811	Q2
Journal of Clinical Virology	997	980	17	Netherlands	0.970	0.01530	3.02	Q2
Journal of General Virology	6498	6185	313	England	0.883	0.01877	2.809	Q2

Table 3. Ranking of **Coronavirus Researcher** based on Record Number (1970-2019)

Author	Affiliation	Record	% of 5128	h-index	Citation	Self-Citation	Pure Citation
Enjuanes L	Department of Molecular and Cell Biology, National Center of Biotechnology (CNB-CSIC), Madrid, Spain	114	2.223	42	4105	603	3502
Perlman S	Department of Microbiology and Immunology, University of Iowa, Iowa City, Iowa, USA	107	2.087	36	2914	266	2648
Yuen KY	Department of Microbiology, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Pokfulam, Hong Kong Special Administrative Region, China	107	2.087	49	10105	862	9243
Weiss SR	Department of Microbiology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA	97	1.892	36	3424	459	2965
Baric RS	Department of Epidemiology, University of North Carolina, Chapel Hill, NC, USA	85	1.658	36	3676	283	3393
Rottier PJM	Virology Division, Department of Infectious Diseases and Immunology, Utrecht University, Faculty of Veterinary Medicine, Utrecht, the Netherlands	84	1.638	41	5146	346	4800
Drosten C	Institute of Virology, Charité Universitätsmedizin, Berlin, Germany.	82	1.599	38	8500	299	8201
Liu DX	Guangdong Province Key Laboratory of Microbial Signals & Disease Control, and Integrative Microbiology Research Centre, South China Agricultural University, Guangzhou, China	73	1.424	30	1867	455	1412
Makino S	Department of Microbiology and Immunology, The University of Texas Medical Branch, Galveston, Texas, USA	72	1.404	33	2904	358	2546
Woo PCY	State Key Laboratory of Emerging Infectious Diseases, The University of Hong Kong, Pokfulam, Hong Kong	67	1.307	34	4831	558	4273

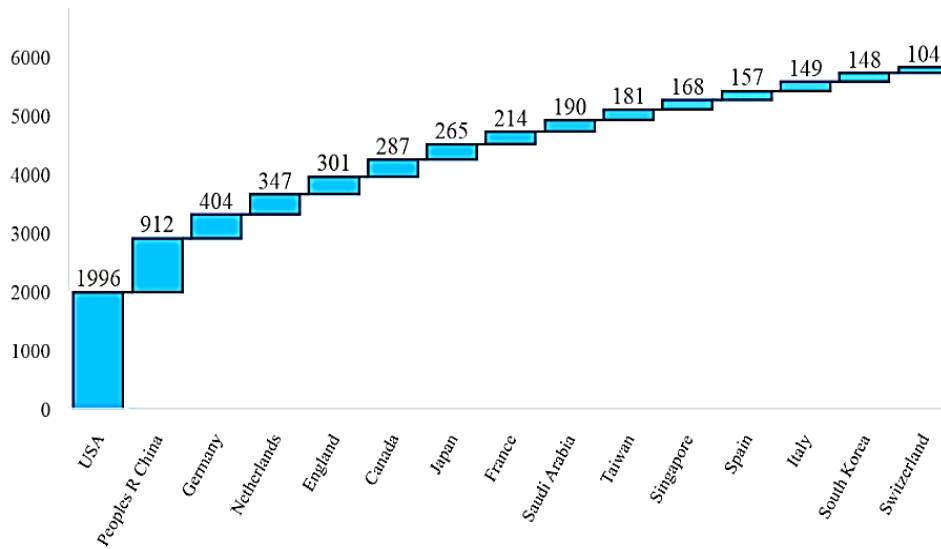


Figure 3. The Most Proliferated Countries in Coronavirus (1970-2019)

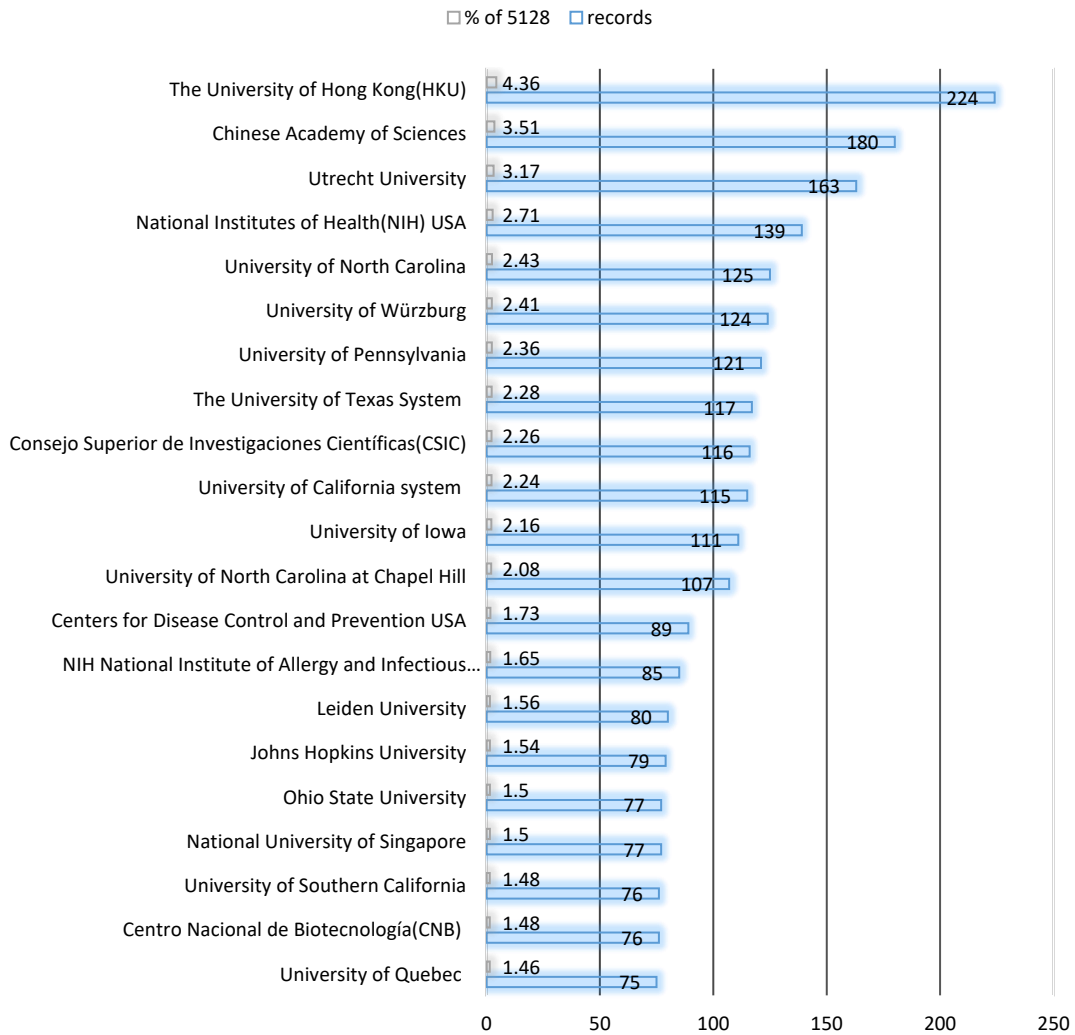


Figure 4. The Most Proliferated Organizations in Coronavirus (1970-2019)

Discussion

In the past 50 years, the fewest frequency of Coronavirus scientific publications were indexed in the WoS from 1970 to 1975 and the most documents were published in 2005, 2004, and 2006. The scientific publications trend of this paper is in line with the results of Bonilla-Aldana *et al.* (14). The United States, the Journal of Virology, the University of Hong Kong, and "Enjuanes L." are the most proliferated ones in the Coronavirus publications, which is in line with the results of Zyoud (24). In terms of increased research activities and scientific publications, the results of this article are similar to those of Shirshahi *et al.* (26), Morovati and Sotudeh (27), and Emami *et al.* (25).

Conclusion

Considering the new and widespread wave of COVID19 infection in China and especially in Iran,

considerable studies and clinical trials are ongoing. The findings of this article can be useful to scientists who are currently researching COVID19, especially Iranian specialists. It recommended that the paper summary will design in brochure format and widely disseminate to the researchers through the Iranian Microbiology Society.

Acknowledgment

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Conflict of Interest

Authors declared no conflict of interests.