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Twenty-five years of global research publications trends of novel coronavirus: A scientometrics assessment

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Twenty-five years of global research publications trends of novel coronavirus: A scientometrics assessment

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Abstract:

The study aimed to identify the trends and characteristics of the publication on the novel coronavirus. A total of 2661 publications from Scopus downloaded in the bib.text and CVS format for 25 years to analyze by using scientometrics analysis software, namely Bibliometrix and Vosviewer. The results show that there is very little research conducted before 2002, but exponentially increased after 2003 and 2020 shows the highest number of publications (779). The result reveals that the 1806 publication is in the form of research articles, i.e., 68%. "University Of Hong Kong" has produced the highest publication, i.e., 362. The "Journal of Virology" (JIF = 4.324) has ranked 1 in terms of the number of total publications (173), total citation (9618), g index (90), and h index (57) respectively. "Yuen KY" found as the prolific author (75) and has more collaborative publication (62) as well. The author's keyword "coronavirus" considered the more reliable keyword. The most cited (TC = 2194) article is "A Novel Coronavirus Associated with Severe Acute Respiratory Syndrome" by Ksiazek TG (2003). The study is beneficial for researchers who are currently doing or planning research on coronavirus.

Keywords:

Coronavirus, COVID-19, Sars-Cov-2, Sar-Cov, Mers-Cov, Scientometrics, Publications

1. Introduction:

Coronavirus belongs to the coronaviridae in the nidovirales order. It's a large family, and due to the presence of crown-like spikes on the outer surface of the virus, named as coronavirus. The size ranges from 65 to 125 nm in diameter, and it contains a single-stranded RNA as a nucleic material of 26 to 32 *KBS* in length (Shereen *et al.*, 2020). The coronavirus first discovered in 1931 as an infectious bronchitis virus (IBV) (Pathologists, 1970). The term human coronavirus used first-time as in the year 1965(Kahn and McIntosh, 2005). Later some group of virologists published their research in the journal of "Nature" in 1968 and used the term "coronavirus" to designate the new family of versus. ('Histones-Animal and Vegetable', 1968) In humans, coronaviruses are known to cause respiratory infection ranging from the common cold to more severe diseases like Middle East Respiratory Syndrome (Mers-Cov) and Severe Acute Respiratory Syndrome SARS-CoV. The SARS-CoV transmitted from human to human. The civet (transmitted from cats to humans) has found the Asia Pacific, the majority of the cases reported in China between 2002-2003. The MARS-CoV infection (transmitted from camel contact or consumption of camel product) reported in Saudi Arabia in the year 2012.

The recently developed novel coronavirus (COVID-19) had links with the Huanan seafood market in Wuhan city of China by the end of December 2019. As of September 30,2020, there have been 33,928,195 cases reported globally including USA (7411798), India (6245404), Brazil (4780317), Russia (1176289), Columbia (824042), Peru (811768), Spain (758172), Mexico (176,639738163), Argentina (736609), and South Africa (672572). (Woldmeter, 2020). The WHO announced it as a pandemic on March 11, 202, as "it on just a public health crisis; it is a crisis that will touch every sector. The present study aims to analyze 25 years of global research publications on coronavirus by focusing on scientometrics methods and tools, mapping the coronavirus research output guide the

specialist, scientist, medical professional, and policymakers in the health department, etc. In practice, The scientometrics methods help in the measurement of publication pattern in terms of research growth, prolific authors, identify highly cited articles, most impact author and Journals, etc. There are studies reported about CoV such as; global research trends of MERS (Zyoud, 2016), Current Global Research on Novel Coronavirus Disease (Hossain, 2020), global scientific research on SARS-COV-2 (Ahmi and Mohamad, 2019), global Ebola virus disease research based on SCI during 1987-2019 (Garg and Kumar, 2017), and research productivity on Zika virus research indexed in web of science (Nasir and Ahmed, 2018).

2. Research Objectives:

The objectives of this research are to find out "year-wise research growth," "types of publications," "prolific author," "source impact," "most cited article"; and "collaborations" by authors, institution and countries; "author keywords occurrences" and also to know the latest trends in novel coronavirus research.

3. Methods and Materials

The data for this study has collected from the Scopus. A total of 2661 documents retrieved covering the 25 year study time (1996-2020). The literature search carried out by using the keywords "novel coronavirus" in "article title, abstract, keywords field. Scientometrics tools used to evaluate research growth on novel coronavirus, most impact sources, prolific authors, most cited articles, and publication collaboration by institutions, country, and by authors. The search strategy applied to retrieve the data is (Topic: Novel + Coronavirus, Period: 1996+1997+1998+.... 2020). The data downloaded (on April 19, 2020) in bib text and CVS format in two parts (as Scopus database has a downloading limit). Then the two parts merged by using copy command in CMD to analyze with the help of Microsoft excel, Bibliometrix 3.0,

and Vosviewer (Scientometrics analysis software). Data of the bib.text format has been used in the Bibliometrix 3.0 package of RStudio (Massimo Aria & Corrado Cuccurullo, 2019)), and Data of CVS format has been used in VOS viewer visualizing the Scientific landscape (Nees Jan van Eck, 2020).

4. Results and Discussion:

The results reveal that there are total research publications for the present study is 2661 during the period of 1996:2020. There are 906 sources (journals, books, etc.), average years from publication (6.22), average citation per documents (28.53), average citations per year per papers (4.58), References (88214), keywords plus (11798) & author's keywords (3601), authors (10234) & authors appearances (18299), Authors of single-authored documents (201) & Authors of multi-authored papers (10033), Collaboration by Single-authored documents (251), Documents per Author (0.26), Authors per Document (3.85), Co-Authors per Documents (6.88), Collaboration Index (4.16).

4.1. Year-wise publication of coronavirus:

Before 2002 the research growth was very low, but publications exponentially increased after 2003 during the time of epidemic SARS-CoV. Research growth noted moderate between the period of SARS (2002) and MERS (2012), then a sharp increase marked in research publication after epidemic MEARS in 2012. The year 2020 has recorded a maximum number of publications (779), and the lowest publications (03) recorded in 1998. The highest mean of total citation per article is 223 registered in the year 2015 against 111 publications with five citable years, while the lowest mean of total citation per article recorded in the year 2019. The Highest Mean of citation per year (8.06) recorded in 2003, and the lowest mean of citation per year is 1.01 recorded in 1998. (Refer table 1).

Table 1: Yearly Research growth

Year	NP	Mean TC per Art	Mean TC per Year	Citable Years
1996	5	78	3.26	24
1997	9	38	1.65	23
1998	3	22	1.01	22
1999	6	118	5.59	21
2000	5	59	2.95	20
2001	6	21	1.07	19
2002	6	133	7.4	18
2003	89	137	8.06	17
2004	138	47	2.94	16
2005	122	50	3.34	15
2006	91	37	2.64	14
2007	87	37	2.81	13
2008	99	30	2.5	12
2009	60	83	7.55	11
2010	75	27	2.68	10
2011	69	32	3.59	9
2012	89	59	7.42	8
2013	177	44	6.28	7
2014	137	31	5.32	6
2015	111	223	4.57	5
2016	108	17	4.35	4
2017	128	10	3.25	3
2018	124	6	3.09	2
2019	138	3	2.52	1
2020	779	7	0	0

*NP= Number of publication ** TC = Total citation *** per art= per article

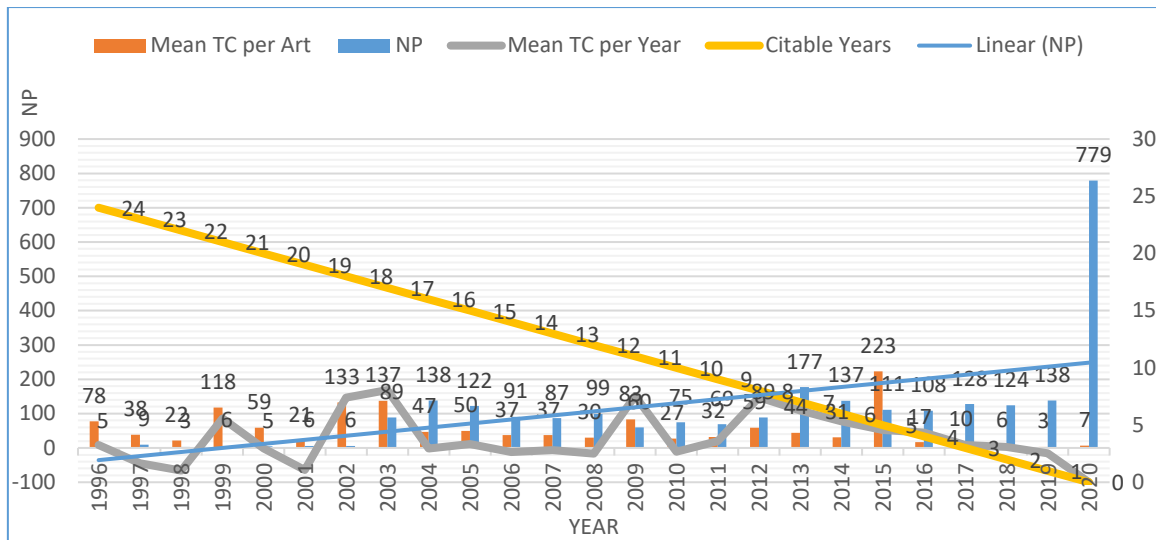


Fig 1: Yearly Research growth

4.2. Types of coronavirus publications:

The data shows that the research published on the topic of coronavirus is comprised of research articles, book chapters, editorials, conference papers, and reviews, etc. The 68% of publications (1806) are in the form of articles, followed by 438 reviews, 115 letters, and 92 editorials, while very low publications only 1, are in the form of the book, conference review, and data paper. (Refer table2).

Table 2: Document types

Document Types	No of Documents	Percentage (%)
Article	1806	67.87
Book	1	0.04
Book Chapter	39	1.45
Conference Paper	25	0.94
Conference Review	1	0.04
Data Paper	1	0.04
Editorial	92	3.45
Erratum	13	0.48
Letter	115	4.33
Note	99	3.75
Review	438	16.45
Short Survey	31	1.16
Total	2661	100

4.3. Top 10 Affiliations:

The "University Of Hong Kong" have rank 1st (362), Huazhong University of Science and Technology rank 2nd (70), and University Of California rank 3rd (61), while Zhejiang University ranked 10th position (43) publications.

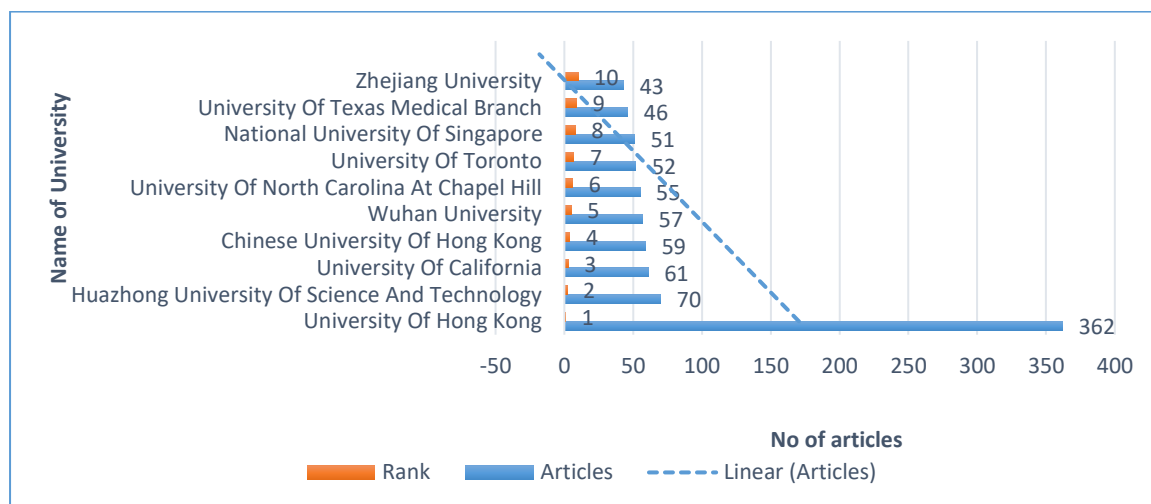


Fig 2: Top 10 Affiliation

4.4. Publication by source Impact:

Table 3 shows fortunately that the "Journal of Virology" with JIF value = 4.324 is ranked 1st in terms of a number of total publications, i.e., 173, total citation = 9618, g index =90 and h index = 57 respectively. The journal "Plos One" with JIF = 2.776 ranked 2nd for number of publication = 60, g-index = 37 & H-index =19; while for total citation ranked 4th (1440). The Journal "Journal of Medical Virology" with JIF value =2.049 ranked 3rd for number publication, i.e., 49 with TC = 549. "The Lancet" journal with JIF value = 59.102 ranked 1st, TC =182, G-index= 34, HR=13 and NPR =34. Moreover, "Eurosurveillance" journal with JIF value =7.421 ranked 10th in respect to publication i.e. 27, but ranked 2nd with values JIF=7.421, TCR = 1489, G-index = 27 & H-index=14.

Table 3: Top 10 Source Impact

Source	H index	H R	G index	G R	TC	TC R	NP	NP R	JIF	JIF R
Journal of Virology	57	1	90	1	9618	1	173	1	4.324	3
Plos one	19	2	37	2	1440	4	60	2	2.776	6
Journal of Medical Virology	11	7	22	6	549	8	49	3	2.049	9
Virology	18	3	34	3	1224	5	41	4	2.657	8
Viruses	10	8	18	8	373	10	38	5	3.811	4
Virus research	15	4	27	4	762	6	36	6	2.736	7
The lancet	13	6	34	3	2182	2	34	7	59.10	1
Vaccine	15	4	25	5	675	7	30	8	3.269	5
Journal of Virological Methods	11	7	20	7	440	9	28	9	1.746	10
Eurosurveillance	14	5	27	4	1489	3	27	10	7.421	2

*HR= H-index Rank **GR= G-index Rank ***TCR= Total citation Rank ****NPR=Number of publication Rank *****JIF= Journal impact factor Rank

4.5. Publication by author's impact:

The author "Yuen KY" is the prolific writer in the field of the novel coronavirus. Fortunately, the author have ranked 1st for number of publications 75, TC = 6957, g-index = 75 and h-index = 41 respectively. The author, "Wang Y," ranked 2nd for the number of publications 57, while ranked 6th in h-index = 16, g-index = 35 with TC = 1288. The author, "Li Y," ranked 3rd for the number of publications, simultaneously positioned 5th in h-index = 18, g-index = 42, and TC = 1824. The author "Chen Y" have least position (10) with regard to NP = 38 and TC = 809, while with reference to h-index = 15 & g-index = 28 respectively.

Table 4: Top 10 authors Impact

Author	H-index	H-Rank	G-index	G-Rank	TC	TC-Rank	NP	NP-Rank
Yuen Ky	41	1	75	1	6957	1	75	1
Wang Y	16	6	35	6	1288	8	57	2
Li Y	18	5	42	5	1824	5	53	3
Zhang Y	16	6	42	5	1788	6	51	4
Woo Pcy	28	2	47	2	3765	2	47	5
Lau Skp	27	3	46	3	3717	3	46	6
Baric Rs	26	4	45	4	2251	4	45	7
Chen J	16	6	29	8	848	9	41	8
Wang J	13	8	34	7	1544	7	34	9
Chen Y	15	7	28	9	809	10	38	10

4.6. Mapping Author Collaboration:

The author "Yuen, K.Y" has the highest rank in research collaboration in regards to publication (62), most cited author (4429), and total strength (403). The writers "Wang, Y (57), Woo, P.C.Y (45), and Lau, S.K.Y (44) have publication collaboration with 1288, 3636 & 3588 citations, respectively. Chen, Y have minimum publication (38) collaboration with 809 citations.

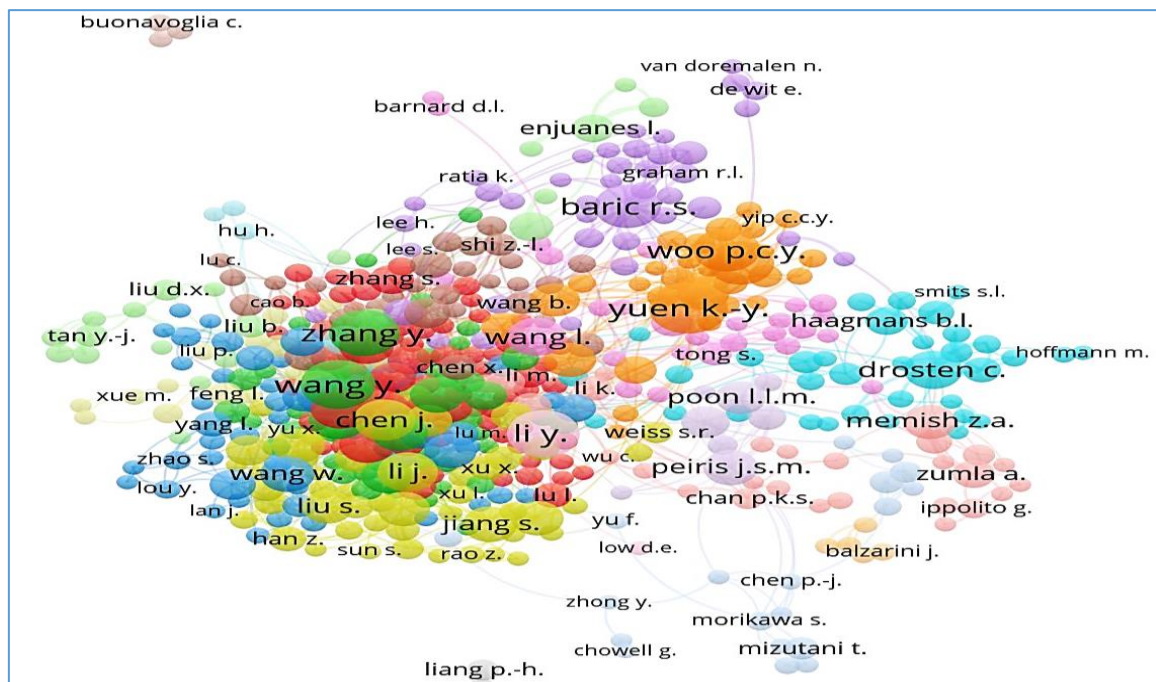


Fig 3: Author Collaboration

Co-authorship selected from 'types of analysis,' and authors selected from a 'unit of analysis'. For counting method criteria, the fractional method used. To conduct the analysis minimum of 5 documents of an author have been considered. There is a total of 10405 authors out of which 512 to meet the thresholds. For each of the 512 authors, the total strength of the co-authorship links with other authors calculated. The authors, with the highest overall link strength, were selected. Full Item was 496, cluster, 19, links 8174, and total link strength 2337.

4.8. Top 10 highly cited articles of novel Coronavirus:

The table below discloses that the article "A Novel Coronavirus Associated with Severe Acute Respiratory Syndrome" by Ksiazek TG (2003), published in the journal "New Engl J Med" has the highest number of total citation (2194) with 122 TC per year. Another article entitled "Identification of a Novel Coronavirus in Patients with Severe Acute Respiratory Syndrome" by Drosten C (2003), published in "New Engl J Med," has 2nd highest total citation (2046) with 114 TC Per Year. Meanwhile, the article titled "Hospital Outbreak of Middle East Respiratory Syndrome Coronavirus" by Assiri A (2013), published in "New Engl J Med," kept at the lowest total citation (596) with 75 TC per year. The "New Engl J Med" shows mostly cited documents as compared to the other sources mentioned above.

Table: 5 Top 10 highly Cited Articles

Title	Author	Source	Year	TC	TC/year
A novel coronavirus associated with severe acute respiratory syndrome	Ksiazek Tg	New Engl J Med	2003	2194	122
Identification of a novel coronavirus in patients with severe acute respiratory syndrome	Drosten C	New Engl J Med	2003	2046	114
Knocking down barriers: advances in sirna delivery	Whitehead Ka	Nat Rev Drug Discov	2009	1954	163
Characterization of a novel coronavirus associated with severe acute respiratory syndrome	Rota Pa	Science	2003	1579	88
Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia	Zaki Am	New Engl J Med	2012	1431	159
Isolation and characterization of viruses related to the sars coronavirus from animals in southern china	Zaki Am	Science	2003	1051	59
Identification of severe acute respiratory syndrome in Canada	Poutanen Sm	New Engl J Med	2003	868	48
Characterization and complete genome sequence of a novel coronavirus, coronavirus hku1, from patients with pneumonia	Woo Pcy	J Virol	2005	698	44
Hospital outbreak of middle east	Assiri A	New Engl J	2013	596	75

respiratory syndrome coronavirus		Med			
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4.9. Country-wise collaboration of research publications:

China has more country wise coronavirus research collaborations, published (2155) with 2nd highest TC (7988), the USA has 2nd most top research collaboration of publications (1840) with the highest number of total citations (20885). UK, Germany, and Japan show collaborative research publications 358, 321, and 273 respectively, while Saudi Arabia has minimum research collaboration in coronavirus publications (206) with 1749 total citations.

Table 6: Country-wise Collaboration

County	Freq	TC	TC-Rank
China	2155	7988	2
USA	1840	20885	1
UK	358	3000	5
Germany	321	6553	3
Japan	273	1100	8
Canada	270	3192	4
Taiwan	265	265	10
Italy	213	823	9
Singapore	208	1255	7
Saudi Arabia	206	1749	6

Conclusion:

Coronavirus, the deadly infectious disease of a recent pandemic outbreak, started in Hunan china and spread more than 213 countries & territories till now. There are 33,928,195 confirmed infection cases with 1,014,194 confirmed death, and 25,213040 recovered cases reported till September 30, 2020 (WHO). The ten profoundly affected countries are the USA, India, Brazil, Russia, Columbia, Peru, Spain, Mexico, Argentina, And South Africa Italy, France, Germany, the U.K, Turkey, Russia, Iran, and China, respectively, in comparison to cases registered. The research growth of publication was nominal before 2002, but due to the emergence of Sars-CoV (2003) and Mers-Cov (2012), the growth of paper increases

gradually, and a steep rise in the publication growth occurred during the pandemic COVID-19 (2020). The study also reflects that the citations per document are 28.53; average citations per year per document is 4.58, and the multi-authored documents (10033) are more prominent than single-authored papers (201), 68 % publications (1806) is in the form of article. China has played the role of a prolific country in terms of collaborative research having the highest publications (2155). "Journal of Virology" (JIF=4.324) is the most impact journal having 173 papers (with total citation 9618, g index 90 and h index 57 respectively). Moreover, "The Lancet" has the highest journal impact factor 59.102, and the University of Hong Kong" appeared as a very productive institution in producing research publications (362). The highly used and searched author keywords are "coronavirus" Covid-19, Sars-Cov-2, Sars, 2019-ncov, severe acute respiratory syndrome, Mers-cov Sar-Cov, epidemiology, pneumonia. Since more than 213 countries are affected by this pandemic, researchers from every country trying to find the solution to the problem arise with it, not just health care but all most all sectors. Therefore this study helps them to identify the most accurate literature, sources, prolific author to collaborate in the research; to keep abreast of the previous research and development has been done on the topic. Furthermore, the mapping of collaborations and author keywords helps to find the latest trends and knowledge structure of novel coronavirus.

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