

A BIBLIOMETRIC ANALYSIS AND VISUALISATION OF RESEARCH TRENDS IN COVID-19 AND ANTIVIRAL DRUGS

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Abstract

COVID19 is a pandemic caused by SARS COV2. Thus this bibliometric analysis of COVID and antiviral drugs was conducted to understand the active authors, organizations, journals, and countries involved. All articles related to precautions against COVID, published in 2020, from “Scopus” were analyzed using the VOS viewer to develop analysis tables and visualization maps. This article had set the objective to consolidate the literature regarding antiviral drugs against COVID and also to find out the trends related to the same. By analyzing the results from the data by using VOS viewer and discussion in the above section, we conclude that the most active authors are from China. The most productive author is Xu J having the highest average citations and Zhou F with the highest number of citations. Li Y is the most active author, having the highest number of co-authorship linkages and several publications in this domain. The most productive research organization engaged in the research of antiviral drugs against COVID is the Institute Of Clinical Medical Sciences, China-Japan Friendship Hospital as it has the highest number of citations and highest average citation. The highly active country in the research of antiviral drugs against COVID is China with the highest number of citations and publications. However, the country with the highest number of average citations and co-authorship linkages is the USA. The Lancet is the most active journal with the co-highest citation, and average citation.

Keywords: COVID, antiviral drugs, Bibliometric analysis, VOS viewer, Pandemic

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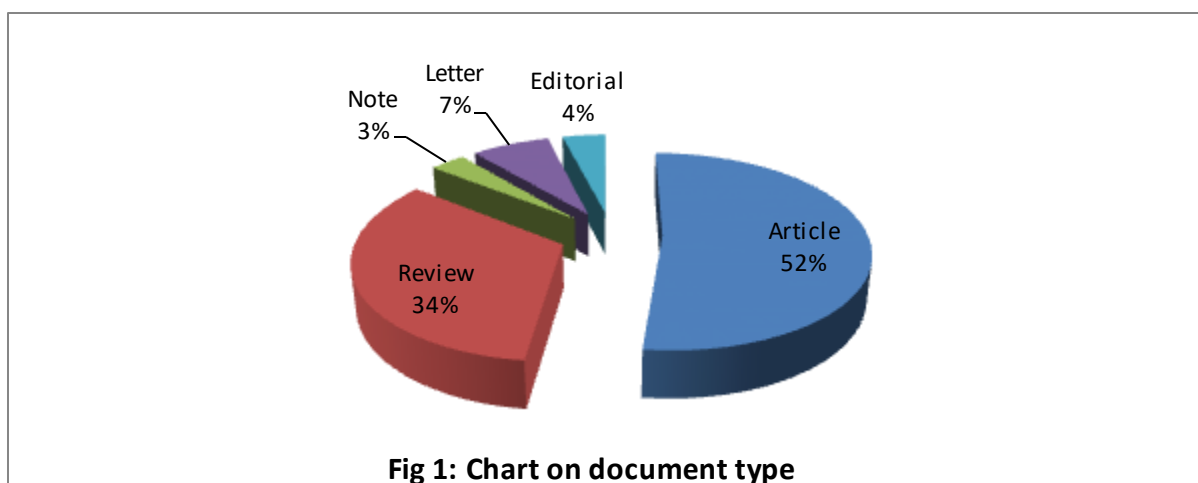
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1. Introduction

Coronavirus disease 19 (COVID19) is a pandemic and caused by SARS COV2. COVID-19 was first reported in Wuhan, China, and its spread across the world. COVID-19 has a comparatively lower mortality rate but is capable of super spreading and social spreading in a short period. Only Social distancing and self-hygiene can avoid this pandemic at this stage.^[1-3] Immunity is very important to control the super spread of the virus. Personal hygiene should include hand washing, use of masks, sanitizer, gloves, and maintaining social distancing. COVID-19 is disastrous with people having comorbidities. A higher degree of research is needed to control the pandemic. Hygiene is an important social determinant of health during the pandemic. There is a huge challenge faced in solid waste disposal during the pandemic.^[4-5] Health workers play a great role in stopping the pandemic. Motivations, overwork, risk of infection, job pressure, lack of rotation are the serious problems faced by health care workers in the field. Till now the treatments involve drug repurposing and we are miles away from an effective vaccine. Antiviral drugs also play an important role in treating COVID patients. Remdesivir, Favipiravir, Chloroquine, and Lopinavir/Ritonavir have commonly used drugs for treating COVID-19 patients across the world. This article is arranged in five sections.^[6-9] The first section is the introduction, followed by the discussion of the methodology by which the research was conducted. The third section deals with results and discussion. The fourth section deals with the conclusion.

2. Research Methodology

Only Scopus source was used in this bibliometric analysis. For the article selection, we had used the Boolean “TITLE-ABS (COVID AND ANTIVIRAL DRUGS)” on 23/10/2020. This first round of search produced an outcome of two thousand and sixty-eight documents, in the English language. The various types of documents and their details had been shown in figure 1. We selected only the articles for this review and thus excluded all the other types of documents in this research.



We used all the one thousand and sixty-five articles (52% of documents) to conduct bibliometric analysis using VOS Viewer. We were inspired by bibliometric analysis in its presentation style, analysis, and methodology from the works. ^[9-12]

2.1 Research Objectives

- a) To consolidate the literature regarding antiviral drugs against COVID
- b) To find out the trends related to research in antiviral drugs against COVID

The following research questions are framed for conducting bibliometric analysis systematically.

2.2 Research Questions

- a) Which are the main journals and articles working related to antiviral drugs against COVID?
- b) Which are the main organizations and countries working on antiviral drugs against COVID?
- c) Who are the active researchers working on antiviral drugs against COVID?

2.3 Methods and tools for evaluation

We used the VOS viewer for conducting bibliometric analysis and visualization. Out of multiple tools available in the VOS viewer, we used co-authorship analysis, Co-occurrence analysis, and citation analysis for this research.

Co-authorship analysis measures the relatedness of items based on the number of co-authored documents. Co-authorship analysis can be possible with three units of analysis, namely, authors, organizations, and countries. Co-authorship analysis had been conducted by analyzing the number of co-authored documents, citations, and average citations per co-authored documents, links, and link strength to identify the closely related authors in a research area. The items with the highest links and link strength were considered for tracing the most effective researchers, journals, articles, organizations, and countries.

Co-occurrence analysis measures the relatedness of items based on the number of documents in which the keywords occur together. Co-occurrence analysis can measure the trends in research. Co-occurrence analysis can be possible with three units of analysis, namely, author keywords, index keywords, and all keywords. The trending keywords and the trend in research are identified by finding out keywords with the highest occurrence and link strength.

Citation analysis can be possible with five units of analysis, namely, authors, documents, sources, organizations, and countries. For citation analysis, citations per documents and total citations were used to identify the most effective researchers, journals, articles, organizations, and countries.

3. Results and discussion

Table 1 shows the details with active researchers in the domain of antiviral drugs against COVID-19. Co-authorship analysis and citation analysis were used in this research. While taking authors as a unit of analysis for the co-authorship analysis, we have taken the parameters of the minimum number of documents of an author as three and the minimum number of citations of authors as one. This combination plotted the map of two thousand two hundred and twenty-three thresholds out of five thousand seven hundred and seventy-seven authors, in twenty clusters. The network visualization map of co-authorship analysis plotted in figure 2, points out the major researchers with their strong co-authorship linkages. The major clusters involved in the research with co-authorship can be identified in figure 2. Table 1 makes it clear that the most productive author is Xu J having the highest average citations and Zhou F with the highest number of citations. Li Y is the most active author, having the highest number of co-authorship linkages and several publications in this domain. From table 2 we can conclude the Chinese authors are leading in respect of citations in research regarding precautions against COVID.

Table 1: Analysis of author activity

Results of Citation analysis				Results of co-authorship analysis (Unit of analysis is authors)	
Authors	Documents	Citations	Average Citations per documents	Authors	Link Strength
Xu J.	3	4047	1349.0	Li Y.	11
Zhou F.	4	4123	1030.8	Wang X.	9
Hoffmann M.	3	2203	734.3	Zhang Y.	9
Kleine-Weber H.	3	2203	734.3	Wang Y.	5
Müller M.A.	3	2203	734.3	Liu Y.	3

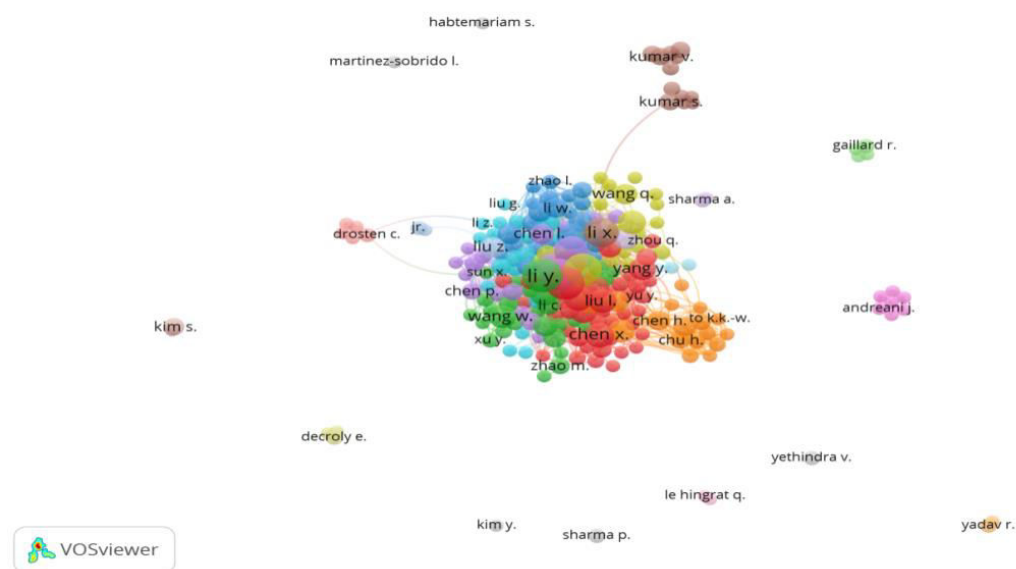


Figure 2: Co-authorship analysis on basis of authors

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrence of a keyword as sixty-four. This combination plotted the map of eighty-five thresholds out of nine thousand and seventy-seven keywords, in four clusters. The network visualization of co-occurrence analysis using all keywords has been shown in figure 3. Figure three identifies the major keywords associated with antiviral drugs against COVID.

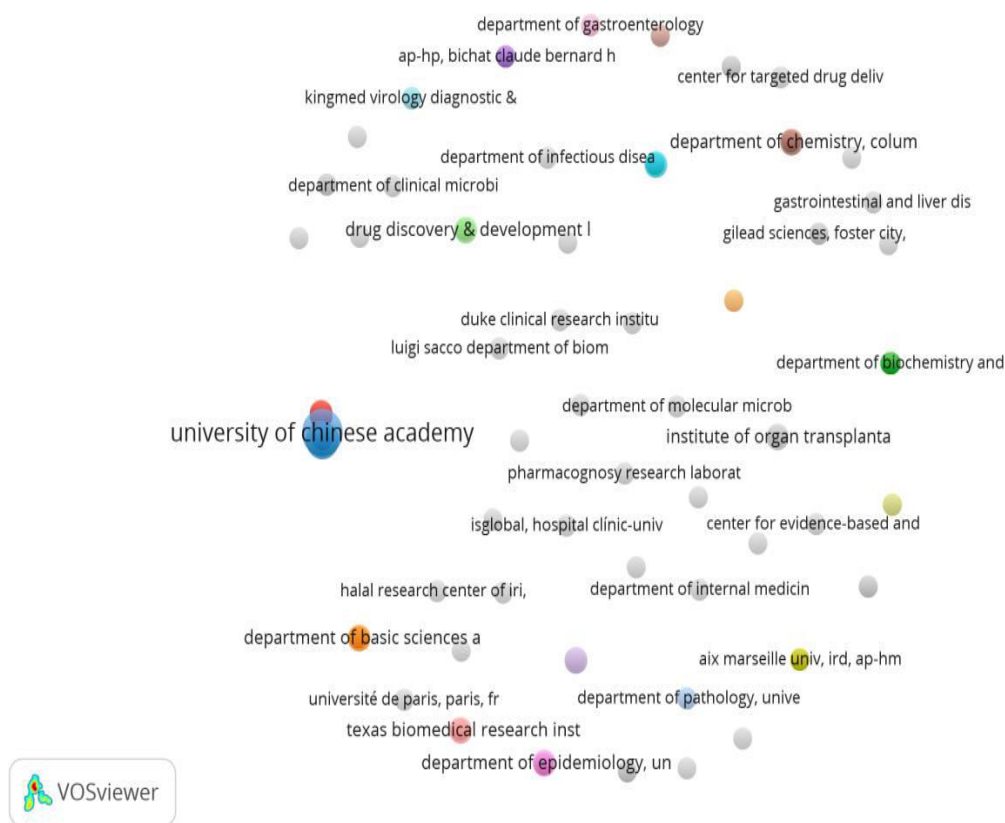


Figure 4: Co-authorship analysis on basis of Organisations

Table 3 shows the countries actively engaged in research on COVID-19 and antiviral drugs. Co-authorship analysis and citation analysis were used in this analysis. While taking countries as a unit of analysis for the co-authorship analysis, we have taken the parameters of the minimum number of documents of a country as ten and the minimum number of citations of a country as two. This combination plotted the map of twenty-seven thresholds out of one hundred and thirty-one countries in five clusters. The network visualization map of co-authorship analysis plotted in figure 5, points out the major research countries with their co-authorship collaborations. The major clusters involved in the research with co-authorship can be identified in figure 5. Similarly, top countries in the area of COVID and antiviral drugs had been highlighted in table 3. From table three it's clear that the highly active country in the research of antiviral drugs against COVID-19 is China with the highest number of citations and publications. However, the country with the highest number of average citations and co-authorship linkages is the USA.

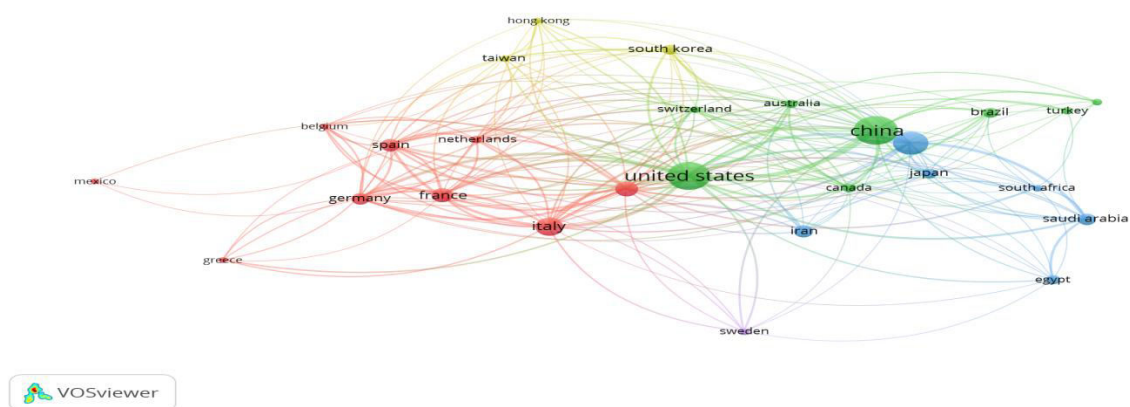


Figure 5: Co-authorship analysis on basis of Country

Table 3: Analysis of activities of countries

Results of Citation analysis				Results of co-authorship analysis (Unit of analysis is countries)		
Country	Documents	Citations	Average Citations per documents	Country	Link Strength	H-Index
Germany	40	3390	84.8	United States	197	2386
Hong Kong	12	761	63.4	China	100	884
China	236	12111	51.3	United Kingdom	95	1487
Netherlands	16	704	44.0	Italy	94	1030
United Kingdom	65	2492	38.3	Germany	76	1298

Table 4 shows the highly cited articles, engaged in research on precautions against COVID-19. Link analysis and citation analysis were used in this analysis. We have taken the parameters of the minimum number of citations as four. This combination plotted the map of three hundred and forty-three thresholds out of one thousand and sixty-five documents. The highly cited articles are highlighted in table 4.

Table 4: List of highly cited articles

Articles	Citations	Co-citation Link	Journal and Publisher details	H-Index	Title
Zhou F. (2020)	4044	35	The Lancet Elsevier Ltd, UK	747	Clinical Course and Risk Factors for Mortality of Adult In patients with COVID-19 in Wuhan, China: A Retrospective Cohort Study
Hoffmann M. (2020c)	2147	21	Cell, Cell Press, USA	747	SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and is Blocked by a Clinically Proven Protease Inhibitor

Cao B. (2020)	1227	27	New England Journal of Medicine, Massachusetts Medical Society, USA	987	A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19
Grein J. (2020)	582	7	New England Journal of Medicine, Massachusetts Medical Society, USA	987	Compassionate Use of Remdesivir for Patients with Severe Covid-19
To K.K.-W. (2020)	540	2	The Lancet Infectious Diseases, Lancet Publishing Group, UK	217	Temporal Profiles of Viral Load in Posterior Oropharyngeal Saliva Samples and Serum Antibody Responses During Infection by SARS-CoV-2: An Observational Cohort Study

Table 5 shows the journals actively engaged in research on COVID-19 and antiviral drugs. Link analysis and citation analysis were used in this analysis. We have taken the parameters of the minimum number of documents of a journal as two and the minimum number of citations of a journal as one. This combination plotted the map of one hundred and thirty-eight thresholds out of four hundred and ninety-six journals. The Lancet is the most active journal with the co-highest citation, and average citation.

Table 5: Analysis of journal activity

Journals	Documents	Citations	Average Citations per documents	Link Strength	H-Index	Publisher
The Lancet	3	4730	1576.7	85	747	Elsevier Ltd, UK
New England Journal of Medicine	3	1822	607.3	93	987	Massachusetts Medical Society, USA
The Lancet Infectious Diseases	2	719	359.5	4	217	Lancet Publishing Group, UK
Cell	9	2329	258.8	67	747	Cell Press, USA
Bioscience Trends	3	461	153.7	3	28	International Advancement Center for Medicine & Health Research Co., Ltd, Japan

4. Conclusion

By analyzing the results from the analysis by using VOS viewer and discussion in the above section, we conclude that the most active authors are from China. The most productive author is Xu J having the highest average citations and Zhou F with the highest number of citations. Li Y is the most active author, having the highest number of co-authorship linkages and several publications in this domain. The most productive research organization engaged in the research of antiviral drugs against COVID is the Institute Of Clinical Medical Sciences, China-Japan Friendship Hospital as it has the highest number of citations and highest average

citation. The highly active country in the research of antiviral drugs against COVID-19 is China with the highest number of citations and publications. However, the country with the highest number of average citations and co-authorship linkages is the USA. The Lancet is the most active journal with the co-highest citation, and average citation.

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