



Relative Growth Rate and Doubling Time: Corona virus Research

A.J.Rekha

Ph.D.Research Scholar
Department of Library and Information Science
Periyar University
Salem-11

Dr. M. Jayaprakash

Assistant professor
Department of Library and Information Science
Periyar University
Salem-11

ABSTRACT

This study looks at the relative growth rate and doubling time of coronavirus research from 2017 to 2021. Using scientometric analysis, we obtained data using a quantitative study approach with the Web of Science database. The data show that the number of publications is increasing year after year and that it is having an impact on human life daily. The goal of this study is to look at the relative growth and doubling time of coronavirus virus research productivity in Malaysia from 2017 to 2021. Methodology: For the years 2017-2021, the required data was gathered from the Web of Science database. Over 5 years, there were almost 1414 bibliographic records of contributions in the field of coronavirus. For gathering literature from Malaysia, the researcher used the following search strings: TOPIC (also known as "COVID 19" or "SARS COV-2" or "CORONAVIRUS"). According to the study's objectives, 1414 records were downloaded and evaluated using the Histcite software programs. During the study period, this research study investigates the relative growth and doubling time levels. Result: The years 2020 and 2021 have the most publications. The average relative growth rate for the study period was 0.5095, while the average doubling time for publications was 5.0085. The year 2021 has the highest growth rate. The result shows that there were not enough growth values until 2019, because the number of publications remained constant from 2017 to 2019, but that there is a big increase in 2020 and 2021 due to the entry of covid-19.

Keywords: Coronavirus, covid 19, sars-cov-2, scientometrics, epidemic

Received 02 June, 2022; Revised 13 June, 2022; Accepted 15 June, 2022 © The author(s) 2022.

Published with open access at www.questjournals.org

I. INTRODUCTION

Several disease outbreaks have occurred over the world. The Spanish flu, Hong Kong flu, MERS, Swine flu, Ebola, and COVID-19 were all notable pandemics in the twentieth century. SARS, MERS, and COVID-19 are three of these viruses that have had an impact on humans. Human and animal coronaviruses are the two types of coronaviruses.

Background

In the 1930s, the Infectious Bronchitis Virus was found to be infecting a substantial number of farm hens. This was the first time these viral types had been discovered. Years later, in the 1960s, the coronavirus, a human-infecting virus, was discovered. They can cause respiratory infections in humans, ranging from the common cold to more serious conditions such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) (SARS). COVID-19 is the most recent version.

covid-19

On the 31st of December 2019, the WHO China republic office was notified of cases of pneumonia of unknown cause discovered in Wuhan (Hubei province, China). The COVID-19 outbreaks were later declared a public health emergency of worldwide concern by the WHO's International Health Regulations Emergency Committee on January 30, 2020. (PHEIC). On February 11, 2020, the World Health Organization designated the virus as COVID-19. COVID-19 was declared a pandemic by the Director-General of the World Health Organization, Dr. Tedros Adhanon Ghebreyesus, on March 11th, 2020, based on the outbreak's alarming levels. In addition, WHO claimed that, due to the rapid spread of the new pathogen, the globe is witnessing a relatively new phenomenon known as an infodemic. It spreads from person to person by droplets formed by humans. The pandemic has resulted in widespread lockdowns and travel bans. The global scale of the outbreak is mind-boggling. Medical specialists in some regions of the world have been successful in restricting the spread of the disease through effective testing, social distance, contact tracing, and quarantining suspected patients.

COVID-19 Variant

Viruses are constantly evolving, and this might result in the emergence of a new variant, or strain, of the virus. In most cases, a variation has little effect on how the virus functions. However, they can make it act in a variety of ways at times. The Omicron and Delta variants of Covid 19 are the most common.

On November 24, 2021, WHO received the first report of the Omicron variant, variant B.1.1.529, and on November 26, 2021, WHO designated it as a variant of concern. The classification was decided on the suggestion of the Technical Advisory Group on Virus Evolution, based on information from South Africa indicating the variation contains a large number of mutations and has resulted in a negative change in COVID-19 epidemiology.

On May 11, 2021, WHO identified the Delta variation as a variant of concern, and it is currently the main form circulating globally. Delta spreads faster than previous strains of the virus, resulting in more cases and deaths around the world. All currently available COVID-19 vaccines are safe and effective in avoiding serious sickness and death from the Delta variant.

Scientometrics

We employed scientometrics to do our quantitative study. The science of assessing and quantifying science is known as scientometrics. Scientometrics is a type of bibliometrics that is used to measure the impact of scientific publications. The research of Eugene Garfield and Derek J. de Solla Price focuses on current Scientometrics. In 1969, two Russians named Z. Mulchenko and V. Nalimov proposed the term Scientometrics to develop the information approach. According to them, scientometrics is a "complex of quantitative approaches used to investigate the experimental scientific process."

OBJECTIVE

To investigate the relative growth and doubling time of coronavirus virus research productivity in Malaysia from 2017 to 2021.

HYPOTHESES

With the above-mentioned goal in mind, the following hypothesis is made and tested using statistical tools. The doubling time for publications demonstrates a rising tendency, as does the proportional growth rate of total scientific publications.

II. METHODOLOGY

For the year 2017-2021, the required data was gathered from the Web of Science database. Over 5 years, there were almost 1414 bibliographic records of contributions in the field of coronavirus. For accessing literature from Malaysia, the researcher used the following search strings: TOPIC ("COVID 19" or "SARS COV-2" or "CORONAVIRUS"). According to the study's objectives, 1414 records were downloaded and evaluated using the Histcite software programs. During the study period, this research study investigates the relative growth and doubling time rates.

III. REVIEW OF LITERATURE

A literature review is a summary of previously published materials related to the study proposal under consideration. The literature review outlines the most essential concerns that a researcher should consider during his or her research trip. The goal of a literature review is to examine previous research that has already been completed. Here are a few important elements related to areas:

Bhattacharya and Singh (2020) have provided a comprehensive grasp of the many aspects of this disease coronavirus in their words. Researchers are actively investigating this. It has resulted in a huge volume of research being produced in a short amount of time.

Radanliev et al. (2020) performed a fast review of the literature to identify current knowledge gaps. According to this, the top countries with the top 1000 historical data records on pandemics and epidemics are the United States, England, Australia, and China.

Gomez (2020) looked at several COVID-19 treatments, to decrease the viral load. Since the SARS outbreak in 2003, there have been numerous publications on the coronavirus.

According to Zhou and Chen (2020), their findings provide a fairly objective standard for peer scientists and national regimes.

D. Duan and Q. Xia (2021). By looking at COVID-19-related papers from the first six months of the pandemic, this study evaluates trends in international cooperation. COVID-19 items that have been downloaded from the Web of Science Core Collection. According to the data, the top three publishing countries were the United States, China, and England, with Italy following closely behind. COVID-19 received 5,827 articles for evaluation from 6,349 institutions in 128 countries and regions.

Giannoudis, P. V., Chloros, G. D., & Ho, Y. S. (2021) Bibliometric analysis has been used to identify prominent researchers, centers, and research patterns in this essential clinical condition over the previous 30 years. The recordings were made in a total of 12 languages, with English being the most popular.

The 8976 postings were created by 26,079 people from 101 different countries. The number of citations, publishing outputs, groups, journals, organizations, and nations was all investigated in this bibliometric investigation.

Parabhoi, L., Verma, M. K., & Kumar, M (2020). In response to the current study, which spanned the years 2001 to 2020 and spanned 20 years. According to the survey, the United States had the most published literature on Coronavirus, followed by China. The majority of Coronavirus publications are journaled articles and reviews.

Kappi, M., Mallikarjun, B., and Vidyashree, T. (2021) wish to create a bibliometric visualization of all post-covid-19 and mucormycosis investigations. The Scopus database was utilized to acquire all bibliographic documents on the subject of interest. To quantify co-authors, nationalities, and other characteristics, the VOSviewer software tool was utilized to generate and show bibliometric networks.

Relative Growth Rate (RGR)

The rise in the number of publications per unit of time is known as the relative growth rate. One year is used as the time unit here. The following equation proposed by Mahapatra can be used to compute the mean relative growth rate $R(a)$ for a particular time frame.

$$R(a) = \frac{W_2 - W_1}{T_2 - T_1}$$

where,

R = Mean relative growth rate over the specific period of the interval;

W_1 = $\log w_1$ (Natural log of the initial number of publications);

W_2 = $\log w_2$ (Natural log of the final number of publications);

$T_2 - T_1$ = Unit difference between the initial time and final time.

Therefore,

$R(a)$ = Relative growth rate per unit of publications per unit of time (year)

Doubling Time

The relative growth rate and doubling time have a direct equivalent. If the number of publications on a specific subject doubles over time, the difference between the logarithms of the numbers at the start and end of the period must be the logarithms of the number 2. The value of this difference is 0.693. As a result, the following formula can be used to compute the equivalent doubling time for publication:

$$\text{Doubling time (Dt)} = 0.693/R$$

Therefore, Doubling time for publications $Dt(a) = 0.693/R(a)$

LIMITATIONS

This study mainly focuses on the performance of coronavirus research output in Malaysia as indicated in the Web of Science database. Only the years 2017 through 2021 are included in this research.

Relative Growth Rate and Doubling Time of Coronavirus Research Publications

The analysis of coronavirus research output growth rate is one of the most important components of this subject. The goal of this analysis is to determine the current research's trends and growth potential. The proliferation of coronavirus literature, on the other hand, has made it increasingly difficult for scientists to keep up with recent developments in their domains. As a result, providing information to information seekers is the primary responsibility of librarians, who must meet the information needs of scientists from various fields. In this regard, the published literature is used as a benchmark for measuring a discipline's knowledge, and a study of publication growth rates would yield some valuable conclusions. Calculating relative growth rates and doubling

time for publications determines the rate of growth of literature. Table 1 shows data on the relative growth rate and time it takes for the overall research output to double.

Table 1 – Relative Growth Rate and Doubling Time of Coronavirus Research Output.

Year	No.of Publications	Cumulative Total Of Publications	W1	W2	R(a)=W2-W1	Mean R(a)	Doubling Time(Dt)	Mean(Dt)
2017	5	5	1.609	1.609		0.5095		5.0085
2018	5	10	1.609	2.302	0.693		1	
2019	6	16	1.791	2.772	0.981		0.706	
2020	372	388	5.918	5.961	0.043		16.116	
2021	1026	1414	6.933	7.254	0.321		2.158	

In Table 1, the Relative Growth Rate R(a) and Doubling Time D(t) of publications are calculated and displayed. As a result, there were insufficient growth values until 2019, because the number of publications remained constant from 2017 to 2019. The relative growth rates fell from 0.693 in 2018 to 0.043 in 2020, before rising to 0.321 in 2021. The average relative growth rate for the entire study period is 0.5095. In addition, the doubling time for all sources of Coronavirus research output reduced from 1.0 in 2018 to 0.706 in 2019, then increased dramatically to 16.116 in 2020 and 2.158 in 2021.

From the preceding discussion, it is clear that the number of publications of research output on Coronavirus literature is steadily increasing. However, its relative growth rate has been declining, indicating that the rate of increase is low in proportion, as evidenced by the doubling of publishing time, which is more than the relative growth rate. The hypothesis proves it substantially.

IV. FINDINGS

Relative Growth Rate and Doubling Time

The average relative growth rate for the study period was 0.5095, while the average doubling time for publications was 5.0085. However, its relative growth rate has been on the decline, implying that the rate of increase is low in proportion, as evidenced by the doubling time for publications, which is longer than the relative growth rate.

Hypothesis The relative growth rate of total scientific publications has been steadily increasing, and the doubling time for publications has also been steadily increasing, indicating that "Hypothesis" has been proven to be correct.

V. CONCLUSION

The highest publications are in the years 2020 and 2021. The whole study period records the mean relative growth rate of 0.5095 and the mean doubling time for publications is 5.0085. The years 2020 and 2021 have the most publications. The average relative growth rate for the study period was 0.5095, while the average doubling time for publications was 5.0085. The year 2021 has the highest growth rate. The result shows that there were not enough growth values until 2019, because the number of publications remained constant from 2017 to 2019, but that there is a big increase in 2020 and 2021 owing to the entry of covid-19. The contributions made by researchers between 2017 and 2021, as reflected in the Web of Science database, have been quantified in this study. Contributions in terms of the number of publications have not been notable over the last five years. Even though the Web of Science database only contains a limited number of records, it is important to note that the Web of Science database only includes peer-reviewed journals. Overall, Malaysian publications should be encouraged on a worldwide scale.

REFERENCES

- [1]. Bhattacharya, Sujit, and Shubham Singh. "Visible insights of the invisible pandemic: A scientometric, altmetric and topic trend analysis." *arXiv preprint arXiv:2004.10878* (2020).
- [2]. Black fungus (3 January 2022) Retrieved from: <https://www.healthline.com/health-news/black-fungus-is-appearing-in-people-with-covid-19-what-to-know>
- [3]. Blakeman, Karen. "Bibliometrics in a digital age: help or hindrance." *Science progress* 101.3 (2018): 293-310.
- [4]. Duan, Dezhong, and Qifan Xia. "Evolution of scientific collaboration on COVID-19: A bibliometric analysis." *Learned Publishing* 34.3 (2021): 429-441.
- [5]. Durieux, Valérie, and Pierre Alain Geveno. "Bibliometric indicators: quality measurements of scientific publication." *Radiology* 255.2 (2010): 342-351.
- [6]. Giannoudis, Peter V., George D. Chloros, and Yuh-Shan Ho. "A historical review and bibliometric analysis of research on fracture nonunion in the last three decades." *International Orthopaedics* 45.7 (2021): 1663-1676.
- [7]. Gómez-Ríos, David, Víctor A. López-Agudelo, and Howard Ramírez-Malule. "Repurposing antivirals as potential treatments for SARS-CoV-2: From SARS to COVID-19." *Journal of Applied Pharmaceutical Science* 10.5 (2020): 001-009.

- [8]. Mallikarjun, Kappi, B. Mallikarjun, and T. Vidyashree. "Bibliometric Visualisation of Research Performance of Post COVID-19 and Mucormycosis: Where Do We Stand?." *Journal of Drug Delivery and Therapeutics* 11.6 (2021): 31-39.
- [9]. Mahapatra, Gayatri. *Bibliometric studies: on Indian library & information science literature*. Crest Publishing House, 2002.
- [10]. Mucormycosis(15 December 2021). Retrieved from:<https://en.wikipedia.org/wiki/Mucormycosis>
- [11]. Mucormycosis (15 December 2021) Retrieved from: <https://www.who.int/southeastasia/outbreaks-and-emergencies/covid-19/What-can-we-do-to-keep-safe/mucormycosis>
- [12]. Parabhoi, Lambodara, and Manoj Kumar Verma. "Coronavirus research output during 2001-2020: A Scientometrics Analysis." *Library Philosophy and Practice* (2020): 1-14.
- [13]. Pritchard, Alan. "Statistical bibliography or bibliometrics." *Journal of documentation* 25.4 (1969): 348-349.
- [14]. Sivankalai, S., and K. Sivasekaran. "Mucormycosis (Black Fungus) Maiming Covid Patients: scientometrics analysis through prism of Biblioshiny." *LibrPhilosPract* 5546 (2021).
- [15]. What is Covid 19 variant (3 February 2022) Retrieved from: <https://www.webmd.com/lung/coronavirus-strains#1>
- [16]. What is Mucormycosis(15 December 2021) Retrieved from: <https://www.bbc.com/news/world-asia-india-57027829>