Artículo original

Bibliometric Evaluation of the Available Research on Coronavirus (COVID-19)

Evaluación bibliométrica de las investigaciones disponibles sobre el coronavirus (COVID-19)

Adeyinka Tella[1,2*] https://orcid.org/0000-0002-5382-4471

Oluwole Olumide Durodolu[2] https://orcid.org/0000-0003-2734-8165

Joseph Ngoaketsi[2] https://orcid.org/0000-0001-7424-5762

[1]University of Ilorin, Department of Library and Information Science. Ilorin, Nigeria.

[2]University of South Africa, Department of Information Science. Pretoria, South África.

[*]Autor para la correspondencia: tella.a@unilorin.edu.ng

ABSTRACT

Bibliometric research provides a quantitative basis for evaluating the productivity and impact of researchers, research groups, institutions, and even countries. Therefore, this study examined a bibliometric analysis of the available research on Coronavirus**.** We explored the Web of Science, WoS, and database for publications about COVID-19 beginning January 2000 up until December 2021. Only relevant observational and interventional studies on coronavirus covering the study period were included in the study. Data covering publications on coronavirus research from 2000 to 2021 were extracted from the ISI Web of Science on January17, 2022.A total of 96,766 research publications were found. Nine objectives were developed to guide the study. There were many research publications in the year 2021, followed by 2020. The most funding agencies for coronavirus

have been the United States Department of Health Human Services, National Institute of Health NIH, USA, national Natural Science Foundation of China NSFC, NIH National Institute of Allergy Infection Diseases NIAID, National Key Research and Development Program of China, European Union EU. International Journal of Environmental Research and Public Health and PLOS ONE are the leading research outlet on coronavirus in the world as the duo has collectively published 2,196 in the area of coronavirus. The study concluded that the USA, the Peoples' Republic of China, Italy, England, and India are the leading countries that have contributed to research in coronavirus.

Keywords: coronavirus; COVID-19; novel coronavirus; bibliometric; coronavirus disease.

RESUMEN

La investigación bibliométrica proporciona una base cuantitativa para evaluar la productividad y el impacto de investigadores, grupos de investigación, instituciones e, incluso, países. Por lo tanto, este estudio examinó un análisis bibliométrico de la investigación disponible sobre el coronavirus. Exploramos la *Web of Science*, WoS y la base de datos en busca de publicaciones sobre COVID-19 desde enero de 2000 hasta diciembre de 2021. Se incluyeron en el estudio estudios observacionales e intervencionistas relevantes sobre el coronavirus que cubrían el período de estudio. Los datos de las publicaciones sobre la investigación del coronavirus de 2000 a 2021 se extrajeron del ISI *Web of Science* el 17 de enero de 2022. Se encontró un total de 96,766 publicaciones. Se desarrollaron nueve objetivos para guiar el estudio. El año de mayor cantidad de publicaciones fue el 2021, seguido del 2020. Las agencias que más fondos han financiado para el coronavirus han sido el Departamento de Servicios Humanos de Salud de los Estados Unidos, el Instituto Nacional de Salud NIH, EE.UU., la Fundación Nacional de Ciencias Naturales de China NSFC, el Instituto Nacional de Enfermedades Infecciosas Alérgicas de los NIH, el NIAID, el Programa Nacional Clave de Investigación y Desarrollo de China y la Unión Europea UE. *International Journal of Environmental Research and Public Health* y PLOS ONE son los principales medios de investigación sobre el coronavirus en el mundo, ya que el dúo ha publicado colectivamente 2196 en esta temática. El estudio concluyó que Estados Unidos, la República Popular China, Italia, Inglaterra e India son los principales países que han contribuido a la investigación en coronavirus.

Palabras clave: coronavirus; COVID-19; nuevo coronavirus; bibliométrico; enfermedad del coronavirus.

Recibido: 23/02/2023

Aceptado: 22/06/2023

Introduction

The world has been bedeviled with several outbreaks of viruses and diseases. Mentioned can be made of an outbreak of severe acute respiratory syndrome (SARS) in Guangdong, China, in 2003, polio (2014) in African countries, Ebola in West Africa (2014), Zika (2016), and Ebola in the Democratic Republic of Congo (2019). December 2019 ushered into the world another virus outbreak known as New Coronavirus COVID-19 or what others refer to as "novel Coronavirus'. Coronavirus has been around us for more than 50 years contrary to the belief that the virus started in early November 2019. For instance, the isolation of the prototype marine coronavirus strain JHM was reported in 1949 and the molecular mechanisms of replication, as well as the pathogenesis of the severe Coronaviruses, have also been studied since the 1970s.

Our job as information experts is to offer and disseminate information to stop the spread, educate the public so they are well informed, and also to dispel certain false assumptions that the Coronavirus is a disease of 2019. It is on this note that the researcher felt it is essential to provide a brief overview of the bibliometric analysis of Coronavirus research to clear the doubt in terms of whether it started in 2019. Doing so will clear the air concerning the rumor regarding the outbreak of the disease in 2019 instead of 50 years back as literature has confirmed.

This study signifies a call for increased output in informetric evaluation of Coronavirus, this might be based on the belief stated earlier that the virus is a new disease that started in 2019. Most of the available related studies such as

Fan and others,[1] Gong and others,[2] Zyound and others,[3] Chahrour and others[4] were conducted in 2020, in the USA, UK, Australia, Italy, etc. Therefore, the author considers it

necessary as a way of contributing to the existing literature and fight against Coronavirus disease, particularly from the African context where the author originates and where studies of such are currently limited or not available. Therefore, the authors considered this research to be of interest/value to scientific audience based on the provision of additional data and literature from the perspective of authors from a developing country context i.e. the continent of Africa. The data provided in this research can enable a comparison of data on coronavirus research from across the world. This study does not only describe what was done in this research alone but rather demonstrates how the study is related to others in their situations and how they compare data on coronavirus in their country to what was obtained in another country.

Therefore, determining the origin and evolution of 2019-nCoV is important for the surveillance, drug discovery, and prevention of the epidemic. With more and more reported pathogenic 2019-nCoV isolates, it is necessary to look at what research has published and on which subject area of the virus; from which part of the world and by who, and what is the nature and pattern of the publication, and what is the specific focus of such research and as well confirmed when exactly was the outbreak of this disease. It is on that note that the current study examines a brief overview of bibliometric analysis of Coronavirus research globally beginning from 2010 to 2020.

The specific objectives of the study are to:

1. Analyze the categories of the subject areas of Coronavirus that have been published in the literature; determine the list of publications on Coronavirus per year starting from 2010 to 2019; and identify the document types in the publications on Coronavirus.
2. Determine the publication trends on Coronavirus by affiliations, funding agency and by authors.
3. Identify publications productivity analysis on Coronavirus by source titles (the databases) where the publication originated; the publications on Coronavirus based on country, and the language of the publications on Coronavirus.

Literature Review

Coronavirus

Coronaviruses can make humans and animals sick. Some coronaviruses can cause illnesses like the common cold and others can cause more severe diseases, including Severe Acute Respiratory Syndrome (SARS) and the Middle East respiratory syndrome (MERS), Australian Government Department of Health.[5] The new coronavirus originated in Hubei Province, China and the disease outbreak is named COVID-19.

Few related studies to the current one was found in the literature. For instance, Zyoud and others[4] argued in their study that the novel coronavirus tagged the 2019-nCoV or coronavirus disease 2019 (COVID-19) recently which appeared in China and spread globally presents a health threat to the global community. In light of the argument, the authors considered it important for the world to understand the global scientific output of COVID-19 research at the early stage of the outburst, and the need to track the hotspots, to draw special attention to future directions, thereby conducting a bibliometric analysis to appropriate the scenario of COVID-19 till date. The author gathered relevant studies from the Scopus database at the early stage of the outbreak and the analyze the data using well-established bibliometric indices including document types, and country. Collaboration patterns, affiliation, journal name, and citation patterns to map and determine hot topics of the subject matter.

The results reveal that there were 19.044 publications on Scopus published on COVID-19 during the early stage of the outbreak (December 2019 up until June 19, 2020). Of all these publications, 9140 (48.0%) were articles; 4192 (22.0%) were letters; 1797 (9.4%) were reviews; 1754 (9.2%) were editorials; 1728 (9.1%) were notes; and 433 (2.3%) were others. The USA published the largest number of publications on COVID-19 (4479; 23.4%), followed by China (3310; 17.4%), Italy, (2314; 12.2%), and the United Kingdom (UK) (1981; 10.4%). British Medical Journal was the most productive. The Huazhong University of Science and Technology, Tongji Medical, and Harvard Medical School were the institutions that published the largest number of COVID-19 research. The most prevalent topics of research in COVID-19 include “clinical features studies”, “pathological findings and therapeutic design”, “care facilities preparation and infection control”, and “maternal, perinatal and neonatal outcomes”. The author concluded that the study reflected the rapidly

emerging topics on COVID-19 research, where remarkable research has been conducted at the outbreak of the disease.

Chahrour and others[3] explored the activity and trends of COVID-19 research since its outbreak in December 2019. The authors gathered data through exploration of the PubMed database and the World Health Organization (WHO) database for publications relating to COVID-19 published from December 2019 up until March 18, 2020. Only relevant observational and interventional studies were included in our study. Data on COVID-19 incidence were extracted from the WHO situation reports. Research output was assessed concerning the gross domestic product (GDP) and the population of each country. Results: Only 564 publications met our inclusion criteria. These articles came from 39 different countries, constituting 24% of all affected countries. China produced the greatest number of publications with 377 publications (67%). Concerning continental research activity, Asian countries had the highest research activity with 434 original publications (77%). In terms of publications per million persons (PPMPs), Singapore had the highest number of publications with 1.069 PPMPs. In terms of publications per billion-dollar GDP, Mauritius ranked first with 0.075. The study concluded by pointing out that COVID-19 is a major disease that has impacted international public health on a global level. Observational studies and therapeutic trials about COVID-19 are essential for assessing pathogenic characteristics and developing novel treatment options.

COVID-19 was declared a pandemic by the World Health Organization in March 2020. This made Gong and others[3] consider the situation very critical and in their response, the decision to review the state of research on COVID-19 to guide further investigations. Therefore, bibliometric and knowledge mapping analyses of studies on COVID-19 were performed, including more than 1,500 papers on COVID-19 available in the PubMed and China National Knowledge Infrastructure databases from January 1, 2020, to March 8, 2020. In this review, the authors found that due to the rapid response of researchers worldwide, the number of COVID-19-related publications showed a high growth trend in the first 10 days of February; among these, the largest number of studies originated in China, the country most affected by the pandemic in its early stages. The findings also revealed that the epidemic situation and data accessibility of different research teams have caused an obvious difference in the emphasis of the publications. Additionally, there was an unprecedented level of close cooperation and information sharing within the global scientific community relative to previous coronavirus research. The authors combed and

drew the knowledge map of the SARS-CoV-2 literature, explored the early status of research on etiology, pathology, epidemiology, treatment, prevention, and control, and discussed knowledge gaps that remain to be urgently addressed. In conclusion, the study presented future perspectives on treatment, prevention, and control and provided fundamental references for current and future coronavirus research.

Fan and others[1] explored the differences between English language and Chinese language Medical/Scientific journals publications which aimed to explore the efficacy/contents of the literature published in English and Chinese concerning the outcomes of management and characterization of COVID-19 during the early stage of COVID-19 pandemic. The method adopted involved gathering/retrieving publications on COVID-19 research from both English and Chinese databases. Bibliometric analyses were performed using VOSviewer 1.6.14, and CiteSpace V software. Network maps were generated to evaluate the collaborations between different authors, countries/provinces, and institutions. The results reveal that there was a total of 143 English and 721 Chinese original research articles and reviews on COVID-19 included in the study. The results also indicate that most of the authors and institutions of the publication were from China before March 1, 2020. Nevertheless, the distribution of authors and institutions was mainly from developed countries and affluent areas in China.

The range of the keywords in English publications was more extensive than those in Chinese. Traditional Chinese Medicine was seen more frequently in Chinese publications than in English. Of the 143 articles published in English, 54 articles were published by Chinese authors and 21 articles were published jointly by Chinese and other overseas authors. The study concluded that the publications in English had enabled medical practitioners and scientists to share/exchange information. On the other hand, the publications in the Chinese language have provided complimentary educational approaches for the local medical practitioners to understand the essential information to manage COVID-19 in the relatively remote regions of China, for the general population with a general level of education.

Xiao Zhai and others[6] conducted a bibliometric analysis of publications on Long non-coding RNA, lncRNAusing data retrieved from ISI Web of Science (WoS) for a period between 1975 and 2017. The total record analyzed was 3879 having 62967 citations. It was found that there is growth in the research output since 2006 and was predicted to increase

until 2021. China made the highest contribution (63.47%) followed by the USA with 944 articles. Though the USA ranked second it had the highest number of citations (43168 times) and a high H-index (97). The leading journal is OncoTarget with 305 papers. The keywords could be stratified into two clusters: cluster 1 (application) and cluster 2 (characteristics). Correspondingly, the "TNM stage," "epithelial-mesenchymal transition (EMT)," "cell apoptosis" and "overall survival" are research hotspots since 2015.The conclusion was that lncRNA research showed a growing trend, with China making the largest contribution. The relationship between this study and the current one is that both retrieved data from ISI Web of Science. However, while this study focused on IncRNA, the current study focuses on Coronavirus.

Barboza and Ghisi[7] analyzed research publications in the field of Huntington's disease (HD). It was found that the USA had the highest publication count having 30 percent of the total research output on the subject followed by England and Germany, who have published 10.7% of all publications, respectively. Regarding the language in which the articles were written, 98% of publications were in English. Concerning the various knowledge areas that emerged, most publications were in the fields of neuroscience and neurology, likely because HD is a neurodegenerative disorder. Publications are written in areas such as psychiatry, genetics, and molecular biology also predominated. This study is also related to the current one because they both focused on publication on a disease. However, this study focused on HD disease, while the current study focuses on corona disease.

Gupta and Adarsh,[8] analyzed the asthma research output of India for the period from 1999 to 2008. The analysis included growth, rank and global publications share, citation impact, the share of international collaborative papers, the contribution of major collaborative partner countries and the contribution of various subject fields. It also analyses the characteristics of most productive institutions, authors and high-cited papers. Data has been downloaded from the Scopus database It was found that India was in the 15th position among the top 23 countries in asthma research, with its global publication share of 1.27% (862 papers), registering an average citation per paper of 3.43 and achieved an h-index of 33 during 1999-2008. This study is also related to the current one since it addresses publications on asthma while the current study focuses on corona both of which are the disease. However, both are different in terms of the source of data and coverage. While this study extracted its data from Scopus, the current sty extracted its data from ISI Web of Science; and while this study covers 199-2008; the current study covers 2010 to 2020.

From the review of related literature on bibliometric analysis of diseases that have been conducted so far globally, limited or none of the studies have been able to focus on bibliometric analysis on Coronavirus, particularly from the author in the developing country's context. Most of the available studies have succeeded in covering just a limited number of years of research on coronavirus such as 5, 10, and 15 years compare to this study which covers twenty years. Most of these studies also focused majorly on the authorship pattern of coronavirus, publication types, authorship pattern, and publication by countries; compared to the current study which in addition to all of those, features the funding agencies that have been funding coronavirus, the subject matter of coronavirus research that have published, and the language of the publication on coronavirus. This thereby leaves it a grey area in bibliometric, scientometric and informetric research.

Methodology

The study examined a brief overview of bibliometric analysis of research publications on Coronavirus disease using ISI Web of Science as a source to harvest data on available publications. We explored the Web of Science, WoS, and database for publications about COVID-19 beginning January 2000 up until December 2021. This is because Web of Science is a comprehensive bibliographic database that provides access to a wide range of scholarly literature across various disciplines. It is widely used in informetric evaluation because of the extensive coverage. Only relevant observational and interventional studies on coronavirus covering the study period were included in the study. In WoS, publications were identified by searching for the terms such as "novel coronavirus 2019," "coronavirus 2019," "COVID 2019," and "COVID 19" in the search field. All publications between January 2000 and December 2021 were included. Data is limited to the sample size between 2000 to 2021 this is necessary to exclude other cluster to ensure statistical robustness. Bibliometric analysis involves the quantitative analysis of scholarly publications and citations. Tools such as Scopus, Web of Science, and Google Scholar can provide data on publication output, citation counts, author collaboration networks, and other bibliometric indicators. But for the sake of this research, the researchers decided to use Web of Science. For each of the articles identified, the corresponding author's country of origin was identified. The publication type was identified while original articles and case reports were

included in our study. The types of studies included basic science studies, epidemiological studies, randomized control trials, prospective trials, retrospective studies, and case series and reports. Descriptive analysis was done to report the number and type of articles from each country. The number of articles in each country was then compared to the number of confirmed cases to identify countries where more publications are needed. Also, the subject areas on coronavirus, total publications on coronavirus research, and the funding agencies funding researches on Coronavirus from 2000 till December 2021, research published so far on Coronavirus by author, research on coronavirus research by source title of journals, and the dominating language used in published researches on Coronavirus. The period of coverage is 2010 to 2021. The total records downloaded were 96,766 as of December 30, 2021. These records were exported in text form with corresponding tags, and they were imported into the MS Access database. The downloaded data comprised global research publications on Coronavirus. Using SQL, the necessary information was extracted from the database, and the results are presented in figures and tables, as reflected in the results section.

Ethical Statement

This study does not involve any human object. Data for the study was collected from an online Web of Science Database. The content in this paper is the authors' own original work, which has not been previously published elsewhere. The paper is not currently being considered for publication elsewhere. The paper reflects the authors' own research and analysis in a truthful and complete manner. The paper properly credits the meaningful contributions of co-authors and co-researchers. The results are appropriately placed in the context of prior and existing research. All sources used have been properly disclosed (correct citation). Literally copying of text must be indicated as such by using quotation marks and giving proper reference. All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

Results

Table 1 presents results on the findings of the subject areas in the research publications on Coronavirus. TEN areas were identified been covered so far by the Web of Science. Out of

the 10 subject areas, research on General Internal Medicine constituted the highest with 11435 publications (11.817%). This is followed by Infectious diseases with 7953 publications (8.219%), next is research publication on Public Environmental Occupational Health with 7141 publications (7.380%), and next is research publication on Immunology 6502 with publications (6.719%). Research on Virology followed with 6052 publications representing (6.254%), and Microbiology followed with 5226 publications representing (5.401%), Others follow in this order–Science Technology and other Topics, 4989 publications (5.156%), Pharmacology Pharmacy, 4944 publications (5.092%), and Biochemistry Molecular Biology, 4927 publications representing (5.092%), Research Environmental Medicine, 3813, representing (3.940), and Cardiovascular System Cardiology, 3202 which represent (3.402%).

Table 1 - Categories of the subject areas of coronavirus that have been published in the literature

Subject Area	Record Count	Percentage
General Internal Medicine	11,432	11.817
Infectious Diseases	7.953	8.219
Public Environmental Occupational Health	7.141	7.380
Immunology	6.502	6.719
Virology	6,052	6.253
Microbiology	5.226	5.401
Science Technology Other Topics	4.989	5.156
Pharmacology Pharmacy	4.944	5.109
Biochemistry Molecular Biology	4.927	5.092
Research Experimental Medicine	3,813	3.940
Cardiovascular System Cardiology	3.292	3.402

Source: Self made.

Table 2 shows that there was a total of 96, 766 research publications on Coronavirus covering the 21 years of 2000–to August 2021. The most published research publication on Coronavirus was in 2021 with 48.257 publications (49.870%). This is follows by 2020, with 37.389 publications (38.639%) and next is 2019, 815 research publications (0.842%) and 2016, 801 publications (0.828%), 2015, 773 publication representing (0.799%). A total of 753 (0.778%) research was published on coronavirus in 2017. This is followed by 726 publications representing (0.750%) in 2014; and in 2015, 720 publications represented (0.744%) while a total of 469 research (1.51%) was published in 2012. The publications in others follow this order: 2005, 711 publications (0.735%); 2006, 704 publications (0.728%); 2018, 699 publications (0.722%). However, the least research on Coronavirus was published in the year 2000 with 145 publications (0.48%). This might be because the year is still very young or because of the time, it takes to not only be published but to also be indexed in Science Citation Index. The percentage will hopefully increase as the year progresses since several pieces of research on the virus are still currently ongoing. The results here indicate that there were many research publications in the year 2021, followed by 2020, 2019, and down to 2000. This confirms that research on Coronavirus is not just starting in 2019 and that Coronavirus is not just a new disease but a disease that has been around us since 1949 as indicated in the literature by Bonavia and others,[9] Cheever and others.[10]

Table 2 - Research Publications on Coronavirus by year from 2010-2020

Years	Record Count	Percentage
2021	48.257	49.870
2020	37.389	38.639
2019	815	0.842
2018	801	0.828
2017	773	0.799
2016	753	0.778
2015	726	0.750
2014	720	0.744
2013	711	0.735
2012	704	0.728
2011	699	0.722

Source: Self made.

Table 3 shows the research publications on document types on coronavirus. A total of ten document types that featured publications on coronavirus were identified. Out of the ten, articles, journals constituted most of the publications with 69.783 (72.115%) while review followed with 15.374(15.888%) and next Editorial materials followed with 5209 (5.383%), next is Letter, 3961 (4.093%), is Early Access 3, 956 (4.088%) and Proceeding papers followed with 1059 (1.094%). Other document types followed in this order: Meeting Abstract 919 (0.950%), News Item 427 (0.441%), Book Chapter 389 (0.402%), and Corrections310 (0.320%), Data papers 61 (0.063%) constituted the least document type. This indicates that document types of research publications on Coronavirus so far have journal articles.

Table 3 - Publications on Document Types on Coronavirus

Document Types	Record Count	Percentage
Article	69.783	72.115
Review	15.374	15.888
Editorial Materials	5.209	5.383
Letters	3.961	4.093
Early Access	3.956	4.088
Proceeding papers	1.059	1.094
Meeting Abstract	919	0.950
News Items	427	0.441
Book Chapter	389	0.402
Corrections	310	0.320

Source: Self made.

Table 4 shows that there were 10 funding agencies funding research on Coronavirus from 2000 till December 2021. The table reveals that 7.029 (7.264%) research projects on Coronavirus have been funded by the United State Department of Health Human Services. This is followed by the National Institute of Health (NIH), USA 6.710 (6.934%), and National Natural Science Foundation of China (NSFC) 4.595 (4.749%), European Union (EU), 2.319 (2.397%), NIH National Institute of Allergy Infection Diseases (NIAID) 2.280 (2.356%), while UK Research Innovation (UKRI) 1.223 (1.264%), Medical Research Council Uk Marc, 811 (0.838%), National Science Foundation (NSF) 752 (0.777%),National Key Research and Development Program of China followed with 694

(0.717%). Others followed in this order: Conselho Nacional De D Tecnologico Cnpq 668 (0.690%), while the agency that funded the least out of the ten leading agencies is the Ministry of Education Culture Sports Science and Technology Japan MEXT 619 (0.640 %).

Table 4 - Research Publications on Coronavirus by Funding Agency

Funding Agencies	Record Count	Percentage
United State Department of Health Human Services	7.029	7.264
National Institute of Health	6.710	6.934
National Natural Science Foundation of China NSFC	4.505	4.749
European Commission	2.319	2.397
NIH National Institute of Allergy Infectious Diseases NIAID	2.280	2.356
UK Research Innovation Ukri	1.223	1.264
Medical Research Council UkMrc	811	0.838
National Science Foundation (NSF)	752	0.777
National Key Research and Development Program of China	694	0.717
Conselho Nacional De D Tecnológico Cnpq	668	0.690

Source: Self made.

Table 5 shows the research published so far on Coronavirus by the author. The results revealed the productivity of researchers and the leading author is Zhang who has published 507 (0.524%) of the total publication. This is followed by Wang, who has published 483 (0.499), and the third in the rank is Li who has published 423 (0.437%). Liu419 (0.433%); Wang 413 (0.427%); Li 349 (0.361%); Zhang 347 (0.359%); Liu, 327 (0.338%), Yuen, 315 (0.326%), Wang 313, (0.323%). The least contribution is from Chen 300 (0.310%).

Table 5 - Publications on Coronavirus by Author

Author	Record Count	Percentage
Zhang Y	507	0.838
Wang Y	483	0.651
Li Y	423	0.644
Liu Y	419	0.621
Wang J	413	0.575
Li J	349	0.555

Zhang L	347	0.546
Liu J	327	0.542
Yuen KY	315	0.536
Wang L	313	0.470
Chen Y	300	0.310

Source: Self made.

Table 6 presents the results of the Coronavirus research by subject classification. Most publication relating to coronavirus falls under the subject classification of Medicine General Internal representing 9.913 representing (10.244%), Infectious Diseases comes next with 7.953 (8.219%). This is followed by Public Environmental Occupational Health with 7.141 (7.380%) while Emerging Immunology represent 6.502 (6.719%), and Virology has 6,052 (6.254%) and Microbiology 5.226 (5.401%). Other sources subject classifications include Pharmacology 4.368 (4.514%), Biochemistry Molecular Biology 4,162 (4.301%), Multidisciplinary Sciences 3.980 (4.113%), Medicine Research Experimental 3,813 (3.940%), however, by general classification Environmental Science featured the least out of the ten listed above with 2.927 representing (3.025%).

Table 6 – Corona Research Publication by Source Titles

Source Title	Record Count	Percentage
International Journal of Environmental Research Public Health	1.114	1.151
PLOS ONE	1.082	1.118
Journal of Virology	1.032	1.066
Journal of Medical Virology	1.016	1.050
Cureus	942	1.973
Clinical Infectious Diseases	770	1.796
Scientific Reports	694	1.717
Viruses Basel	674	1.697
Emerging Infectious Diseases	628	1.649
International Journal of Infectious Diseases	531	1.549

Source: Self made.

Table 7 shows publications on coronavirus research by countries affiliation. The results indicate that the USA has the most productive country in terms of research publications on

coronavirus with 28,003 output representing (28.939%), followed by the Peoples' Republic of China with 15.487 (16.005%), and Italy with 7.327 (7.572%). England followed with 7.257 (7.500%), India followed with 6.390 (6.604%), Germany 4.457 (4.606%). Other countries followed in this order: Canada 3.908 (4.039 %), Spain 3.588 (3.708 %), Brazil 3.382 (3.495 %) while Australia 3.300 (3.410%), France 3.164 (3.270%) and Iran is the least of the ten on the table with 3.010 (3.111 %).

Table 7 – Publications on Corona Research by Countries

Countries/Region	Record Count	Percentage
USA	28.,003	28.939
Peoples Republic of China	15.487	16.005
Italy	7.327	7.572
England	7.257	7.500
India	6.390	6.604
Germany	4.457	4.606
Canada	3.908	4.039
Spain	3.588	3.708
Brazil	3.382	3.495
Australia	3.300	3.410
France	3.164	3.270

Source: Self made.

The results in table 8 show that the English Language has been the dominating language for research communication globally used in publications on Coronavirus with 93.762 publications constituting (96.896%). Other languages also used in the published research so far are Spanish 1.010 (1.044 %), German 476 (0.492%) publications, Russian 359 (0.371%) and French 214 (0.221 %). Other languages used in the publication of research on Coronavirus are: Turkish 141 (0.146%), Italian 104 (0.107%), Chinese 76 (0.079%), Hungarian 56 (0.058%), and the least is Polish 49 (0.051%).

Table 8 – Language of Research Publication on Coronavirus

Language of Research	Record Count	Percentage
English	93.762	96.896
Spanish	1.010	1.044
German	476	0.492
Portuguese	363	0.375
Russian	359	0.371
French	214	0.221
Turkish	141	0.146
Italian	104	0.107
Chinese	76	0.079
Hungarian	56	0.058
Polish	49	0.051

Source: Self made.

Discussion

The finding of the study reveals there were more corona research publications about virology, General Internal Medicine, Infectious Disease and Immunology, Biochemistry Molecular and Microbiology other related studies have also revealed subjects' areas they covered. This means that specific subject areas covered in bibliometric analysis research are important. Contrary to what Barboza and Ghisi[7] found with their research on Huntington's Disease, which covered very few topics, we found the topics covered by COVID research to be very broad and diverse. Ramin and others[11] report that the most highly cited articles addressed clinical and epidemiologic topics on the disease covered in their study also run contrary to the finding in the current research. What might be responsible for the variation may be the difference in the disease in each of the studies examined.

The value added to research by bibliometric research is enormous because it offers quantitative and data-driven insights into the scholarly landscape, helping researchers, institutions, and policymakers make informed decisions, identify research priorities, and assess the impact and influence of scientific work.

There were many research publications in the year 2021, followed by 2020, 2019, 2018, 2017, 2016 2015, 2014 and 2013. This is not a coincidence because some earlier studies[11,12]

have initially reported grow trend in the research on various diseases they have examined. There was a growing trend in research on Coronavirus from, 2013, 2016 through 2018, and from 2019 to 2021. However, there is the likelihood of experiencing a growth trend again in 2020 based on the outbreak of the diseases and relentless spread across the globe.

Document types of research publications on Coronavirus so far have journal articles. Some earlier studies have also indicated journals as the outlet in which research on most the publications on the diseases they have studies were published. Mentioned can be made of Rahul and Nishy,[12] who identified journals in which research on the disease of mycobacteria tuberculosis and leprosy which they studied were published.

The most common funding agencies for Coronavirus have been the United State Department of Health Human Services National Institute of Health, National Natural Science Foundation of China (NSFC) NIH National Institute of Allergy Infectious Diseases (NIAID), and National Key Research and Development Program of China. It is not new that research on diseases is funded by agencies. This is because such are always time, money, and resources consuming and greater than what an individual researcher can bear hence the reliance on funding agencies. Therefore, the finding that identified agencies that fund research on Coronavirus in this study is not a coincidence. Similarly, the revelation about the author that mostly publishes on Coronavirus is not new. The current study revealed Zhang, Wang, Li, Liu, Wang, Li, Zhang, Liu, Yuen, Wang, Chen are the leading researchers on Coronavirus in the world as the duo has published five pieces of research each on Coronavirus. This corresponds with the earlier report by Rahul and Nishy,[12] who revealed that apart from collaboration pattern, the paper also identified the major institutions, prolific authors and preferred journals. This means that authors are always identified and recognized in terms of their contributions to the research published on a disease.

The major source type of research publications or subject classification on which Coronavirus is published is General Internal Medicine and USA has published mostly on coronavirus research followed by the Peoples Republic of China, Italy and England. It could be observed from here that the WoS itself clearly leans toward the advanced or first world countries and that research from “The Global South” is not well represented in the database. This is a systemic bias that should be addressed. This is relevant to what is obtained in the literature where studies have reported that countries that are most published contributed mostly to a peculiar disease. For instance, studies such as Xiao Zhai and others[6] who

indicated China as the highest contributor to research they examined followed by the USA lend credence to the current study. Though the USA ranked second it had the highest number of citations and a high H-index.

The study by Barboza and Ghisi[7] analyzed the research publications in the field of Huntington's disease (HD) and found that the USA had the highest publication count having 30 percent of the total research output on the subject followed by England and Germany also support the current finding.

The English Language has been the dominant language of research communication used in the research publications on Coronavirus. This corresponds with the earlier findings in a related study by Barboza and Ghisi[7] who analyzed the research publications in the field of Huntington's disease (HD) and declared that, regarding the language in which the articles were written, 98% of publications were in English.

Conclusion

The findings of the study have shown that there were more coronavirus research publications in Virology, General Internal Medicine, Infectious Disease and Immunology, Biochemistry Molecular, and Microbiology. There were many research publications on coronavirus mostly from the year 2020, down to 2013. Document types of research publications on Coronavirus so far have journal articles. The most funding agencies for Coronavirus have been the United State Department of Health Human Services National Institute of Health, National Natural Science Foundation of China NSFC, NIH National Institute of Allergy Infectious Diseases NIAID, and the National Key Research and Development Program of China. Zhang, Wang, Li, Liu, Wang, Li, Zhang, Liu, and Yuen are the leading researchers on Coronavirus in the world as the duo has published five research each on Coronavirus. The major source type of research publications on Coronavirus is the International Journal of Environmental Research and Public Health, PLOS ONE then the Journal of Virology and the USA has published mostly on corona research followed by the Peoples Republic of China, Italy and the English Language has been the common language used in the research publications on Coronavirus.

As evident from the findings of the study, the funding agencies funding researches on Coronavirus are currently limited. Most of them are domiciled in advanced countries. Considering this, developing countries should not consider the disease as advanced countries' disease, though it is like it, however, it has become a global disease now.

Therefore, agencies in every part of the world are encouraged to make the fund available for Coronavirus. Particularly agencies and private individuals in developing countries should also consider funding research on coronavirus since the outcomes will benefit all and sundry. Besides, the outcomes will be useful in the country where the agency is domiciled and the world at large.

Also arising from the findings of the study, it is noticed that some countries have not published single research on Coronavirus. In light of this, each country in the world is implored to encourage their researchers to do something in this area. They can make funds available as motivation for the researchers to start something.

Furthermore, the findings have shown that research on Coronavirus is only available in eight languages. From the literature, roughly 6.500languages are spoken in the world today. Given this, efforts to translate all available research on Coronavirus into all the languages of the world should be encouraged. This will allow more comprehensive access and dissemination, education, enlightenment, and awareness of the research reports thereby saving lives and soil and promoting safe living.

References

1. Fan J, Gao Y, Zhao N, Dai R, Zhang H, Feng X, *et al*. Bibliometric Analysis on COVID-19: A Comparison of research between English and Chinese studies. Front. Publ Heal. 2020; 8:477. DOI: https://doi.org/10.3389/fpubh.2020.00477

2. Gong Y, Ma T, Xu Y, Yang, R, Gao, L Wu S, *et al*. Early Research on COVID-19: A Bibliometric analysis. The Innovation. 2020;1:100027. DOI: https://doi.org/10.1016/j.xinn.2020.100027

3. Zyoud SH, Al-Jabi SW. Mapping the situation of research on coronavirus disease-19 (COVID-19): a preliminary bibliometric analysis during the early stage of the outbreak. BMC Infectious Disease. 2020;20:561. DOI: https://doi.org/10.1186/s12879-020-05293-z

4. Chahrour M, Assi S, Bejjani M, Nasrallah AA, Salhab H, Fares M, *et al*. A Bibliometric Analysis of COVID-19 Research Activity: A Call for Increased Output. Cureus. 2020;12(3):e7357. DOI: https://doi.org/10.7759/cureus.7357

5. Australian Government Department of Health. Coronavirus (COVID-19) pandemic. 2020 [access 21/12/2022]. Retrieved from: https://www.health.gov.au/health-alerts/covid-19

6. Xiao Z, Zhao J, Wang Y, Wei YZ, Li YY, Chen Z, *et al*. Bibliometric Lovesick Analysis of Global Scientific Research on lncRNA: A Swiftly Expanding Trend. 2020 [access 21/12/2022]. Retrieved from: http://downloads.hindawi.com/journals/bmri/2018/7625078.pdf

7. Barboza LA, Ghisi NC. Evaluating the current state of the art of Huntington disease research: a scientometric analysis. Braz Jour of Med and Biolog Rese. 2018;51(3):45-60.

8. Gupta BM, Adarsh B. A scientometric analysis of Indian research output in medicine during 1999–2008. Journal of Natural Science, Bio and Med. 2011;2(1):87-100. DOI: https://doi.org/10.4103/0976-9668.82313 PMID: 22470241; PMCID: PMC3312706.

9. Bonavia A, Zelus BD, Wentworth DE, Talbot PJ, Holmes KV. Identification of a Receptor-Binding Domain of the Spike Glycoprotein of Human Coronavirus HCoV-229E. Journal of Virology. 2003;77(4):2530-38. DOI: https://doi.org/10.1128/JVI.77.4.2530-2538

10. Cheever FS, Daniels JB, Pappenheimer AM, Baily OT. A murine virus (JHM) causing disseminated encephalomyelitis with extensive destruction of myelin. I. Isolation and biological properties of the virus. J. Exp. Med. 1949;90 83):181-210. DOI: https://doi.org/10.1084/jem.90.3.181

11. Rahul A, Nishy I. Mycobacterial tuberculosis and leprosy in India: a scientometric study. Anna of Lib and Infor Stud. 2016;63(2);140-53. DOI: https://doi.org/10.56042/alis.v63i2.12589

12. Ramin S, Pakravan M, Habibi G, Ghazavi R. Scientometric analysis and mapping of 20 years of glaucoma research. Inter Jour of Ophthal. 2016;9(9):1329-35. DOI: https://doi.org/10.18240/ijo.2016.09.17

Conflict of Interest

As far as the study is concerned, there is no conflict of interest whatsoever.

Authorship Contribution

Conceptualisation: Adeyinka Tella.

Data Curation: Adeyinka Tella.

Formal analysis: Adeyinka Tella, Joseph Ngoakestsi

Investigation: Wole Durodolu.

Methodology: Adeyinka Tella,Oluwole Olumide Durodolu, Joseph Ngoaketsi.

Project administration: Adeyinka Tella, Oluwole Olumide Durodolu, Joseph Ngoaketsi.

Supervision: Adeyinka Tella, Oluwole Olumide Durodolu, Joseph Ngoaketsi.

Validation: Adeyinka Tella, Oluwole Olumide Durodolu, Joseph Ngoaketsi.

Display: Adeyinka Tella.

Writing (original draft): Adeyinka Tella, Oluwole Olumide Durodolu, Joseph Ngoaketsi.

Writing (review and editing): Adeyinka Tella, Oluwole Olumide Durodolu, Joseph Ngoaketsi.