

An analysis of scientific activities in the first year of the COVID-19 pandemic

COVID-19 Pandemi'nin ilk yılındaki bilimsel faaliyetlerin analizi

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SUMMARY

Objective: COVID-19, a contagious disease which is caused by novel coronavirus (SARS-CoV-2), is still spreading globally. Bibliometric analyses assess the current status and trends in a specific research domain by using several (Scopus, PubMed, Web of Science) databases. The aim of present study is to evaluate the scientific activities in the first year of the COVID-19 pandemic on scientific output.


Method: Web of Science software was used for the search and the analysis. All scientific papers published about COVID-19 included in Science Citation Index Expanded (SCI-E) from January 1st to December 13th 2020; the date of the study, were searched by using the terms of “COVID-19”, “2019-n-CoV”, “SARS-CoV-2”, “Coronavirus disease 19” and “2019 novel coronavirus” as scientific nomenclatures of COVID-19 in the topic search section of the software.

Results: Overall; 47368 scientific papers related to COVID-19, indexed by SCI-E, were found related to COVID-19 between January 1, 2020 to December 13, 2020. The biggest contribution for publications was from United States of America, the most of the publications was articles, the authors that contribute to the literature ≥ 150 papers were all from China and the journal that published the most paper was *British Medical Journal*.

Conclusions: The present analyse reports an overview of the literature on COVID-19 since the beginning. These kind of periodic analysis provides interesting insights regarding the past and progress of each area of scientific knowledge and also can guide the rethinking of scientific data.

Keywords: COVID-19, 2019-n-CoV, SARS-CoV-2, Coronavirus disease 19, 2019 novel coronavirus

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ÖZET

Amaç: Yeni koronavirüsün (SARS-CoV-2) neden olduğu bulaşıcı bir hastalık olan COVID-19 hala küresel olarak yayılıyor. Bibliyometrik analizler, çeşitli (Scopus, PubMed, Web of Science) veritabanlarını kullanarak belirli bir araştırma alanındaki mevcut durumu ve eğilimleri değerlendirir. Bu çalışmanın amacı, COVID-19 salgınının ilk yılındaki bilimsel faaliyetleri bilimsel çıktı üzerinden değerlendirmektir.

Yöntem: Arama ve analiz için Web of Science yazılımı kullanılmıştır. 1 Ocak - 13 Aralık 2020 tarihleri arasında Science Citation Index Expanded (SCI-E) kapsamındaki COVID-19 hakkında yayınlanan tüm bilimsel makaleler; Web

of Science yazılımının konu arama bölümünde COVID-19 ile ilişkili “COVID-19”, “2019-n-CoV”, “SARS-CoV-2”, “Coronavirus hastalığı 19” ve “2019 yeni koronavirüs” terimleri kullanılarak arandı.

Bulgular: Genel olarak; SCI-E tarafından indekslenen COVID-19 ile ilgili 47368 bilimsel makale, 1 Ocak 2020-13 Aralık 2020 tarihleri arasında COVID-19 ile ilişkili bulundu. Yayınlar en büyük katkı Amerika Birleşik Devletleri'nden geldi. Tüm yayınların çoğunluğunu makaleler oluşturmaktaydı. Literatüre ≥ 150 makale ile katkıda bulunan yazarlar Çin'dendi. En çok yayın paylaşan dergi ise *British Medical Journal*'du. En çok makaleyi yayınlayan dergi oldu.

Sonuç: Mevcut analiz, başından beri COVID-19 ile ilgili literatüre genel bir bakış sunmaktadır. Bu tür periyodik analizler, her bilimsel bilgi alanının geçmişi ve ilerlemesi hakkında ilginç bilgiler sağlar ve ayrıca bilimsel verilerin yeniden değerlendirilmesine rehberlik edebilir.

Anahtar sözcükler: COVID-19, 2019-n-CoV, SARS-CoV-2, Koronavirüs hastalığı 19, 2019 yeni koronavirüs

INTRODUCTION

COVID-19, a contagious disease which is caused by novel coronavirus (SARS-CoV-2), is still spreading globally ^{1,2}. SARS-CoV-2 is a spherical, enveloped, positive-sense, single stranded, RNA coronavirus. It belongs to the order Nidovirales and genus of β -coronavirus of Coronaviridae family ^{1,3}. The first COVID-19 case was emerged in late December 2019 in Wuhan, China and on 11th March, 2020 World Health Organization (WHO) declared COVID-19 as pandemic ¹⁻⁴.

Bibliometric analyses assess the current status and trends in a specific research domain ⁵ by using several databases (Scopus, PubMed, Web of Science) ^{4,6}. There are a few bibliometric studies that analyzed worldwide data in the literature ^{2,7}. All of them had analyzed the scientific reactions in the first half of the pandemic so none of them has been evaluated a wide number of papers as in this search.

The aim of present study is to evaluate the scientific activities in the first year of the COVID-19 pandemic on scientific output.

MATERIAL AND METHODS

Web of Science (WoS) software, which is a popular database for data extraction for bibliometric analysis ⁴, was used for the search and the analysis. Ethics Committee Approval is not necessary for this kind of analysis. To analyse scientific productivity of all scientific papers published about COVID-19 included in Science Citation Index Expanded (SCI-E) from January 1st to December 13th 2020; the date of the study, were searched by using the terms of “COVID-19”, “2019-n-CoV”, “SARS-CoV-2”, “Coronavirus disease 19” and “2019 novel coronavirus” as

scientific nomenclatures of COVID-19 in the topic search section of the software. We applied an “Advanced Search” by using search operators as AND, OR and NOT to reduce the risk of overlapping of papers in this time span. We further analyzed these results by the “analyze” function of the software in terms of number of publications up to the date of the study, web of science categories, contribution of authors, name of journals, types of documentations and number of papers for each country. And also we searched “With how many publications did countries contribute to the top 5 publication types” and “With which publication types did top 5 countries contribute to the literature”.

RESULTS

Overall, 47368 papers, indexed by SCI-E, were found related to COVID-19 between January 1, 2020 to December 13, 2020. In terms of specialities, according to science categories of WoS database, the most contribution was from Medicine General Internal (n=6443), followed by Public Environmental Occupational Health (n=3525), Infectious Diseases (n=2831), Surgery (n=2406) and Immunology (n=2122). Regarding numbers of each authors' contributions, Wang Y (n=207) was ranked first row, Wang J (n=192) was ranked second row, Zhang Y (n=186) was ranked third row, Liu Y (n=176) was ranked fourth row and Li Y (n=169) was ranked fifth row in the list. Other authors' publication counts were ≤ 165 . Top 10 journals that published over 250 papers were *British Medical Journal* (n=1109), *Journal of Medical Virology* (n=707), *International Journal of Environmental Research and Public Health* (n=573), *Lancet* (n=423), *Plos One* (n=403), *JAMA Journal*

of *The American Medical Association* (n=378), *New England Journal of Medicine* (n=274), *International Journal of Infectious Diseases* (n=268), *Critical Care* (n=265) and *Sustainability* (n=250) (Table 1).

The types of publications were mostly articles (44.51 %) and followed by letters (20.67 %), editorial materials (18.38 %), early access (12.48 %) and review (10.81 %). Other publications' percentages of contribution were under 10 % (Table 2). Regarding numbers of countries contributions, The United States of America (USA) was ranked first row for all types of publications. Peoples R China (PRC) ranked second row for article and review; third row for letter and early access and fourth row for editorial material.

Italy ranked second row for letter and early access and third row for article, editorial material and review. England ranked second row for editorial material and fourth row for article, letter, early access and review.

When we limited our analyzer results to top 5 countries for the contribution to publications; India contributed with letter, early access and review; Germany and Canada contributed to top publications only with article and editorial materials respectively (Table 2). Publications were dominantly in English (n=46133)(97.39 %), then in Spanish (n=417)(0.88 %), German (n=414)(0.87 %), French (n=229)(0.48 %) and Portuguese (n=66)(0.13 %). The number of papers published with languages of other countries were ≤ 50 .

In this period, the biggest contribution was from USA (29.09 %), and followed by PRC (14.53 %), Italy (11.63 %), England (10.22 %), and India (5.06 %). Other countries' percentages of contribution were under 5%. Top 5 countries contributed to the literature with article. While PRC, Italy and India shared second row for letter; USA and England shared second row for editorial materials (Table 3).

Table 1: COVID-19 researches from January 1 to December 13, 2020

Terms used for analysis	“COVID-19”, “2019-n-CoV”, “SARS-CoV-2”, “Coronavirus disease 19”, “2019 novel coronavirus”
Number of publications	47368
Web of science categories (Contribution n \geq 2000)	Medicine General Internal (n=6443) (13.60 %)
	Public Environmental Occupational Health (n=3525) (7.44 %)
	Infectious Diseases (n=2831) (5.97 %)
	Surgery (n=2406) (5.07 %)
	Immunology (n=2122) (4.48 %)
Contributor authors with studies over the number of 150	Wang Y (n=207)
	Wang J (n=192)
	Zhang Y (n=186)
	Liu Y (n=176)
	Li Y (n=169)
	Liu J (n=165)
	Zhang L (n=153)
	Wang L (n=150)
Top 10 journals that published the papers	British Medical Journal (n=1109)
	Journal of Medical Virology (n=707)
	International Journal of Environmental Research and Public Health (n=573)
	Lancet (n=423)
	Plos One (n=403)
	JAMA Journal of The American Medical Association (n=378)
	New England Journal of Medicine (n=274)
	International Journal of Infectious Diseases (n=268)
	Critical Care (n=265)
Sustainability (n=250)	

Table 2: Distribution of top 5 publication types of studies on COVID-19 from January 1 to December 13, 2020 due to the WoS

Article (n=21087) (44.51 %)	USA (n=6297)
	Peoples R China (n=4120)
	Italy (n=2380)
	England (n=1950)
	Germany (n=1187)
Letter (n=9793) (20.67 %)	USA (n=2026)
	Italy (n=1520)
	Peoples R China (n=1239)
	England (n=1095)
	India (n=641)
Editorial material (n=8709) (18.38 %)	USA (n=3426)
	England (n=1130)
	Italy (n=811)
	Peoples R China (n=573)
	Canada (494)
Early Access (n=5913) (12.48 %)	USA (n=1535)
	Italy (n=734)
	Peoples R China (n=647)
	England (n=581)
	India (n=514)

Table 3: Distribution of top 5 countries according to the contribution rates on COVID-19 studies from January 1 to December 13, 2020 due to the WoS

USA (n=13781) (29.09 %)	Article (n=6297)
	Editorial Material (n=3426)
	Letter (n=2026)
	Early Access (n=1535)
	Review (n=1518)
Peoples R China (n=6884) (14.53 %)	Article (n=4120)
	Letter (n=1239)
	Review (n=831)
	Early Access (n=647)
	Editorial Material (n=573)
Italy (n=5511) (11.63 %)	Article (n=2380)
	Letter (n=1520)
	Editorial Material (n=811)
	Early Access (n=734)
	Review (n=691)
England (n=4845) (10.22 %)	Article (n=1950)
	Editorial Material (n=1130)
	Letter (n=1095)
	Early Access (n=581)
	Review (n=567)
India (n=2398) (5.06%)	Article (n=1081)
	Letter (n=641)
	Early Access (n=514)
	Review (n=419)
	Editorial Material (n=238)

DISCUSSION

This bibliometric study analyzed n=47368 publications' data related to COVID-19, that were published between January 1, 2020 to December 13, 2020 and extracted from the WoS database. This is the largest sample of COVID-19 related papers analysis we encountered in the literature. The relevant bibliometric studies that analyzed worldwide data for COVID-19 were first had a relatively smaller time span and so they had smaller samples; second produced contradictory results due to the analyze dates⁴.

Most of the publications are in English followed by Spanish and German. Chinese as a publication language ranked the ninth row according to our results. A bibliometric analysis reported that the most used language for publications in the early stages of the pandemic was English⁸. Contrary to this finding, another search stated that in the earliest stages of the epidemic, the number of articles published in Chinese was approximately 2.5 fold larger than the number of articles published in English³. This may be because China was the most severely affected country in early stages of pandemic³ and/or papers published in English acted as a barrier to the utilization of information in China⁷. On the other hand, in another study (on March 1th, 2020 the date of study), the authors stated that publications in English were also reported by Chinese authors. They preferred English as a language to share knowledge internationally. However, since English publications could not be written properly according to grammar in every region of China; in some regions of China, Chinese authors preferred to wrote the reports in Chinese⁷.

“*Medicine General Internal*” publications are the highest in the list of Web of Science categories, followed by “*Public Environmental Occupational Health*” and “*Infectious Diseases*”. According to our study “*Anonymous authors*” ranked the first row on the list of authors. Although “*Anonymous authors*” ranked the first row, a remarkable number of authors are identified. Eight author published over 150 papers. Wang Y was found as the leading researcher with 207 publications. According to our study results, all authors with over 150 publications were from China.

The “*British Medical Journal*” is the leading journal that published the COVID-19 related researches. It is followed by Journal of “*Medical Virology*”, “*International Journal of Environmental Research*” and “*Public Health*”. Most of the papers were published in journals that have high impact factor⁶.

Article is on the top with the highest publications followed by letter and editorial material. Previous publications had also reported conflicting results on this issue. While some reported that article was the highest publication type; some reported the reviews was the the highest publication type³. Our previous analysis that compared first quarter with first half of the year for COVID-19 reported that editorial material and article were top type of publications respectively⁹.

USA is the most contributed country to the publications on COVID-19 according to our analysis. It is followed by PRC, Italy, England and India. But in the early phase of the pandemic PRC rank the first row with published articles. USA ranked second row. Japan and European countries such as United Kingdom, Germany and Italy followed these countries^{1,3,8}. In a study, authors stated that journal publications on COVID-19 suggested scientists to collaborate and launch the joint research projects. So China has collaborated with 21 countries including US, Canada, Japan, Europe and Southeast Asia³. According to reports in the literature, China had thickest cooperation with USA^{6,7} which is consistent with the publications retrieved from the database⁷. The probable explanations for this cooperation are having superior conditions for basic medical research and experimental trials including economic resources, advanced equipment and skilled researchers^{6,7}. On the other hand, it may be due to positive correlation with the production rate of the countries and their casualties inflicted by the pandemic as the publications hypothesized^{4,6}.

Limitations of the study are 1) “*Anonymous authors*” ranked the first row on the list of authors, 2. WoS software version cannot analysis citations for number of publications over than 10.000.⁹ 3) Additionally, the fact that only SCI-E publications were investigated in this study can be considered as another limitation.

CONCLUSION

The present analyse reports an overview of the literature on COVID-19 since the beginning. These kind of periodic analysis provides interesting insights regarding the past and progress of each area of scientific knowledge and also can guide the rethinking of scientific data.

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