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COVID-19 influences both physical and mental health: Lessons from bibliometric analysis

Letter to the Editor

The pandemic of Coronavirus Disease 2019 (COVID-19) has had, in the past two and a half years, an unprecedented effect on all aspects of our daily lives, such as health, economics, education, traveling, business, sports, and others [1]. Scientists and researchers fight against the diseases from clinical applications to fundamental aspects such as diagnosis, clinical therapy, vaccination, immunology, and virology, and the research outcomes are reflected and displayed in publications. The analysis of publications, called bibliometrics, is broadly used to quantitatively investigate scientific research [2]. Bibliometrics has been reported to be helpful in enabling an objective evaluation of scientific research and presenting relevant research hotspots [3,4]. In this report, we conducted a bibliometric analysis of the literature related to COVID-19 from January 1, 2020 to June 30, 2022, to gain a comprehensive understanding of the current state of COVID-19 studies (the methods are shown in Supplementary Data).

We first retrieved the articles related to coronavirus published from January 1, 1992 to June 30, 2022. The outbreaks of both severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002 and Middle East Respiratory Syndrome coronavirus (MERS-CoV) in 2012 in Middle Eastern countries increased the publication output related to coronavirus research [5]. Particularly, the publication output after the outbreak of SARS-CoV-2 increased from hundreds of articles per year to tens of thousands of articles per year (Fig. 1A). Then, we focused on the publications related to SARS-CoV-2 and COVID-19. Among the publications, 149,388 were recorded as “Articles; ” 28,124, “Letters; ” 25,803, “Editorial Materials; ” and 20,925, “Review Articles” (Supplementary Table 1). The high publication number of “Letters” and “Editorial Materials” implies that researchers—and especially journal editors—are highly concerned with COVID-19 research. We concentrated on analyzing the “Articles” as they generally report the results of original research. Only a few hundreds of articles related to COVID-19 were published per month in the first 4 months of the disease prevalence (Fig. 1B). The publication amount increased gradually and reached 7,090 per month 1.5 years after the COVID-19 outbreak (June 2021). Around 6,000–8,000 articles have been published per month from May 2021 until now. Among the “articles” on COVID-19, the United States (39,948) contributed to the highest number of publications, followed by China (18,936) and the United Kingdom (13,024; Fig. 1C). We further analyzed the publications of top-30 institutes in the countries (Fig. 1D). Harvard University (1,854) in the United States and Huazhong University of Science and Technology (1,525) in China had the highest number of publications. The cooperation network of the institutes showed that the institutes located in a same country or continent frequently cooperated (Fig. 1D). The institutes preferred to cooperate locally, even with the number of institutes for analysis increasing to 50 (Supplementary Fig. 1), suggesting that COVID-19-related travel restrictions also

restricted the cooperation of the scientific community.

Keyword co-occurrence analysis was used to investigate the hotspots of research on COVID-19 (Fig. 1E). In the top-30 keyword co-occurrences, “COVID-19” ranked first, with 83,467 occurrences, followed by occurrences of “SARS-CoV-2” (23,572) and “coronavirus” (13,464). Keywords related to physical disease, such as “mortality,” “infection,” and “pneumonia” occurred 4,756, 3,829, and 3,367 times, respectively. Surprisingly, the keywords related to mental health occurred more frequently than keywords related to physical health. The keywords “mental health,” “anxiety,” “depression,” and “stress” occurred 6,355, 4,879, 4,770, and 4,006 times, respectively, suggesting that SARS-CoV-2 not only affected physical health but also psychological health. Psychological problems might have arisen owing to fear of spreading the disease to close family members and these included frustration, loneliness, despair, and others [6]. It has also been reported that the lockdown was negatively associated with a modest change in the mental health of the overall population [7], implying that the psychological effect caused by COVID-19 should be given the necessary attention.

A total of 10,880 journals published papers on SARS-CoV-2 and COVID-19 (Supplementary Table 2). Among them, the *International Journal of Environmental Research and Public Health* has been the most productive, publishing 3,462 articles, followed by *PLoS ONE* (2,701) and *Scientific Reports* (1,641), however, the top-cited articles are not from the three journals. We retrieved the top-10 most cited papers related to COVID-19, which reflect the trends in research on COVID-19 and were mainly published in clinical journals (Supplementary Table 3). The top-4 most cited papers reported the discovery of SARS-CoV-2 and the clinical features of patients in Wuhan, China. A paper reporting the penetration of SARS-CoV-2 into the cell by binding of the virus spike and host ACE2 was cited more than 8,000 times. Another paper reporting the antibody responses to SARS-CoV-2 was cited 8,000 times until June 2022. Other studies have presented the genomic characteristics of SARS-CoV-2 and the clinical characteristics of hospitalized patients. The high number of citations of these articles suggests that physical health is the most critical issue that the scientific community is concerned with; additionally, research that could provide a theoretical basis for therapy and pharmaceutical discovery is also of interest to scientists.

Overall, we used bibliometrics to investigate publications in the field of SARS-CoV-2 and COVID-19. The findings of this study highlight that scientific communities invest significant efforts in research related to the virus and diseases. However, the travel restrictions seem to have restricted cooperation between scientists. Additionally, not only physical health problems but also physiological distress caused by SARS-CoV-2 should be considered by clinical physicians and governments.

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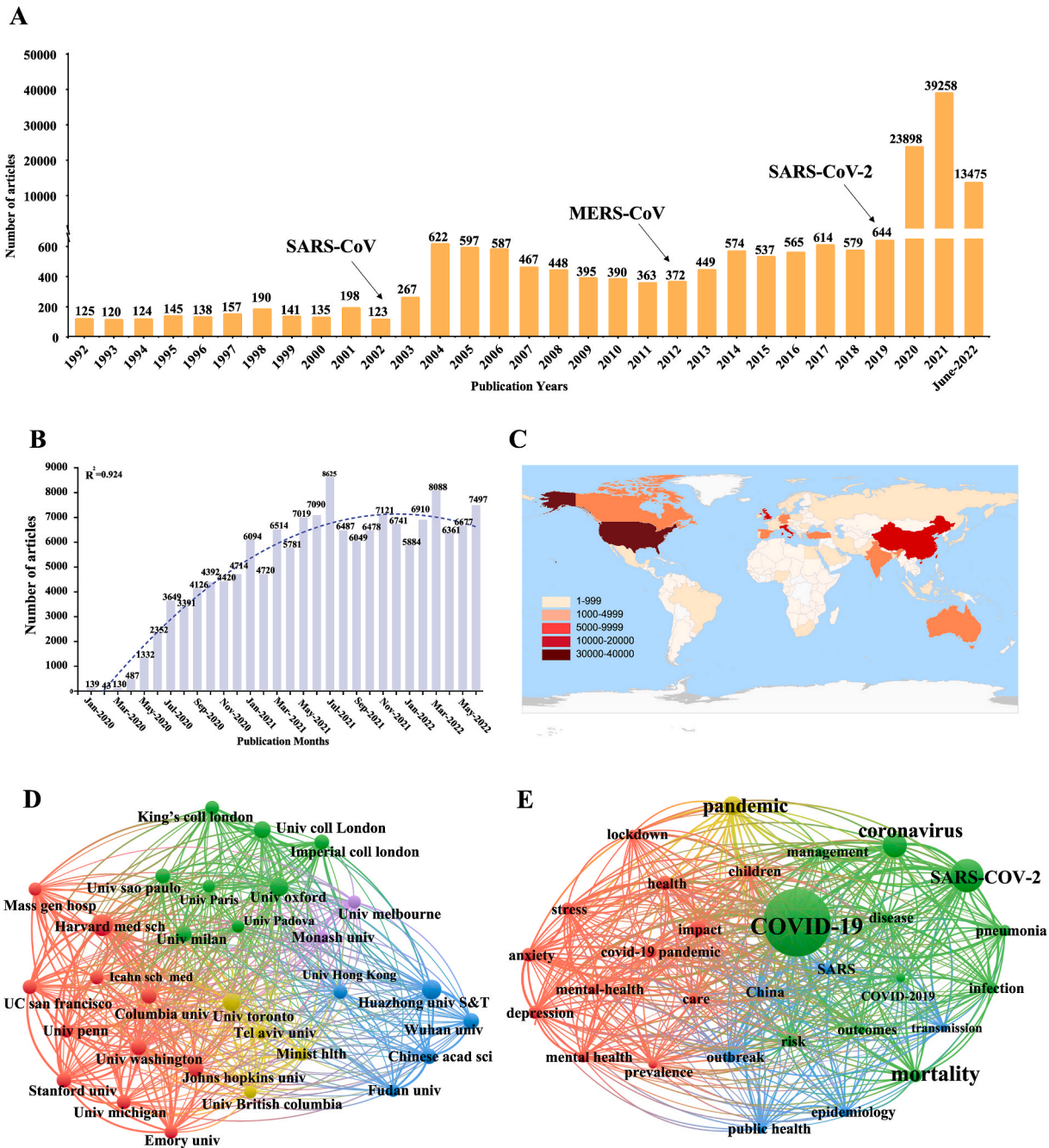


Fig. 1. A. The number of published articles each year in the WoSCC database from 1992 to June 2022. B. The curve of published articles each month on COVID-19 and SARS-CoV-2 from January 2020 to June 2022. C. Geographical distribution of global output. D. The collaboration network of the top-30 most productive institutions. The size of the node presents the number of articles published by an institution, and the width of the edge between the two nodes indicates the degree of cooperation between the two institutions. The institutes belonging to the same country or region are presented by the same color. E. Network of top-30 keyword occurrence. The size of the node presents the frequency of keyword occurrences, and the width of the edge presents the frequency of co-occurrence of two keywords. The color of the node presents different type of clustering: SARS-CoV-2 and physical diseases (green), mental health (red), epidemiology (blue), and pandemic (yellow). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

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Credit authorship contribution statement

CL and BJ designed the research; JZ and COJ analyzed the data; XZ and YZ helped to analyze the data; All authors reviewed the results and approved the final version of the manuscript.

Declaration of competing inter

The authors state they have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tmaid.2022.102405>.

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