The Impact of COVID-19 Pandemic on Scientific Research: an Upcoming New Wave?

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The coronavirus disease (COVID)-19 pandemic continues to have an impact on health care. A potential new wave can be foreseen concerning the impact of the pandemic on medical research and literature. We focused our attention on journals belonging to "Medicine, General and Internal" Clarivate™ category and "Q1" journal impact factor quartile. We found that since January 2020, 9621 papers regarding COVID-19 have been published in these journals. This occurred at the expense of non-COVID-19-related scientific papers as most journals did not increase the total number of their published articles. Thus, our analysis may outlook a new potential scientific wave related to COVID-19, in addition to the clinical ones, possibly delaying the improvement in the quality of care for other diseases in the next years.

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The novel coronavirus disease (COVID)-19 pandemic has had and still continues to have an extraordinary impact on health care.[1] Different types of the effects of the pandemic over the short-, medium-, and long-term periods have been interestingly depicted, and four different waves associated with COVID-19 have been identified. These address the immediate response to COVID-19 outbreak and pandemic, the postponing of other urgent health conditions, the interruption of the care of chronic conditions, and the psychological trauma caused within the broader population, respectively.[2] However, a potential fifth wave of COVID-19 can be foreseen concerning the impact of the pandemic on the entire world of medical science. Indeed, over the past 2 years, the attention of physicians, researchers, and scientific journals has been partially and legitimately directed to the pandemic. This might occur at the expense of scientific research in other clinical settings of similar prevalence and relevance. The ultimate and most important role of medical journals is to advance scientific knowledge and impact on patient care. This is particularly true for high-impact-factor journals, which largely influence the community of scientists, clinical guidelines, and hence, daily clinical practice.[3]

In order to explore the impact of COVID-19-related publications, we focused our attention on journals belonging to "Medicine, General and Internal" Clarivate™ category and "Q1" journal impact factor quartile. We exploited Pubmed® to extract papers published from January 1, 2018, to December 31, 2021, specifying those related to COVID-19 (adding "COVID-19" OR "Coronavirus" OR "SARS-CoV-2" as search criteria) for each journal. Then, we used histograms, box-and-dots plots, density plots, and correlation plots to assess the number of COVID-19 reports on journal publication rate. Analysis and plots were performed using the "R" statistical environment.

Since January 2020, an overwhelming number (n = 9962) of papers focusing on COVID-19 has been published in the considered Q1 General and Internal Medicine journals (Fig. 1A). Notably, the percentage of papers regarding COVID-19 ranged approximately between 10 and 50% of the total number of publications (Fig. 1B). It occurred at the expense of non-COVID-19-related scientific papers, as most of these journals did not increase the total number of their published articles (Fig. 2A). Interestingly, the higher was the impact factor of the journal, the greater was the percentage of articles on COVID-19 (Fig. 2B).

We fully acknowledge the crucial role of the scientific production on COVID-19 in helping health personnel and scientists in the management of this disease, especially with the frontline experiences being very precious. However, the high percentages of papers dedicated to COVID-19 on high-ranking medical journals considered in our analysis may outlook a new potential scientific wave paralleling the clinical one. In other words, just as clinical care has been largely devoted to COVID-19 and the management of other pathologies has been partially neglected, so too medical journals have prioritized COVID-19, significantly slowing down the publication of non-COVID-19-related studies. However, it cannot be excluded that some of the non-COVID-19 research articles were published in other scientific journals with lower impact or from other fields. Moreover, all the efforts dedicated to the research on COVID-19 has been partially subtracted from investigations focusing on other clinical and basic science

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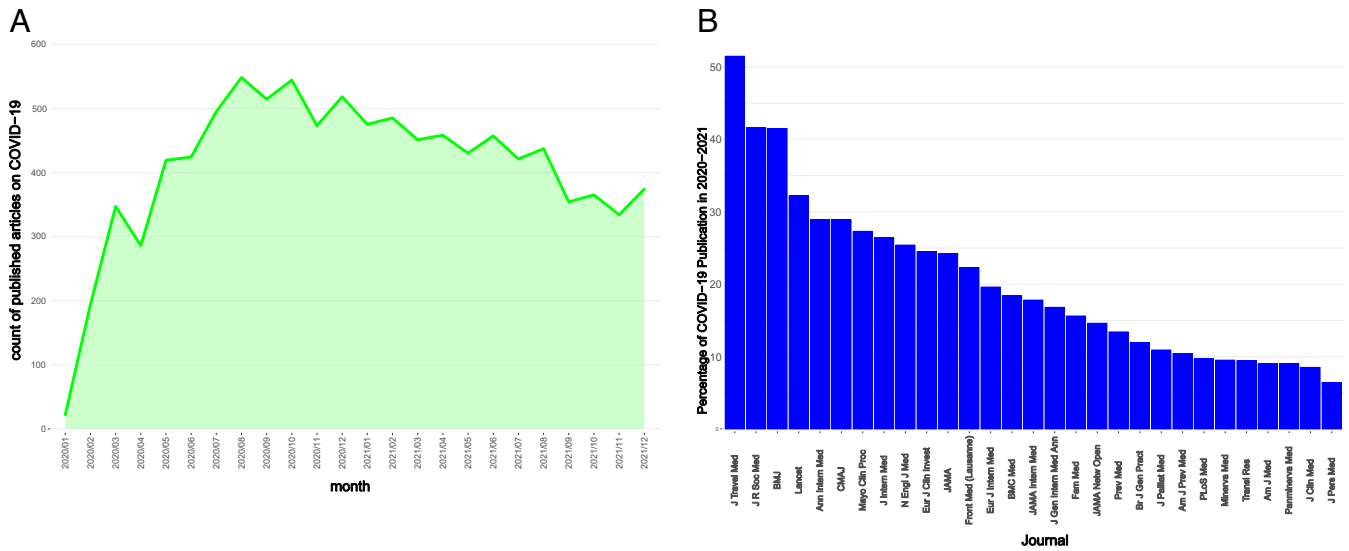

Figure 1 A The density plot shows the "scientific wave" of COVID-19, represented as the rolling average, evaluated over 3 months, of COVID-19 publications (*y*-axis) in each month from January 1, 2020, to December 31, 2021 (*x*-axis). Our search criteria consisted of "COVID-19" OR "Coronavirus" OR "SARS-CoV-2" (with the possibility of abbreviations), the time range, and the name of journals we considered for the analysis: "N Engl J Med," "Lancet," "JAMA," "BMJ," "Ann Intern Med," "JAMA Intern Med," "PLoS Med," "J Intern Med," "BMC Med," "J Travel Med," "JAMA Netw Open," "CMAJ," "Mayo Clin Proc," "Transl Res," "Br J Gen Pract," "J R Soc Med," "Panminerva Med," "Ann Fam Med," "J Gen Intern Med," "Front Med (Lausanne)," "Am J Prev Med," "Am J Med," "J Pers Med," "Minerva Med," "J Palliat Med," "Eur J Clin Invest," "Eur J Intern Med," "J Clin Med," and "Prev Med." All article types were considered in the analysis. B The histogram shows the ratio between COVID-19 publications and the total number of publications in the years 2020 and 2021 for the General and Internal Medicine journals considered.

settings. Interestingly, a recent study noted that by May 2020, ClinicalTrials.gov had registered more than 1200 COVID-19-related trials.[4] As clinical guidelines are mainly based on studies published in high-impact-factor journals, it can be hypothesized that in the next years there will be a slowdown in updating the guidelines. Therefore, a potential delay in the improvement in the quality of care for major diseases could occur.

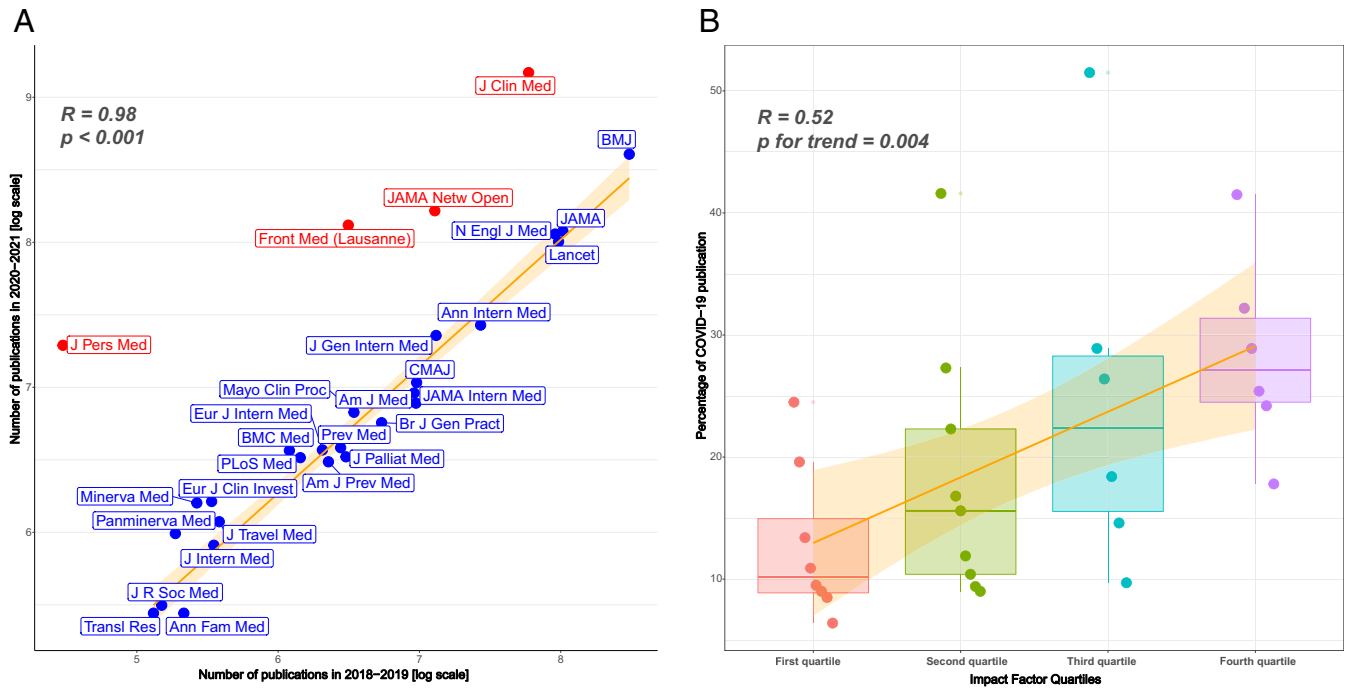

Figure 2 A The scatter plot shows the correlation between the number of publications in the years 2018 and 2019 (*x*-axis) and 2020–2021 (*y*-axis) for the General and Internal Medicine journals considered. Excluding 4 journals (red dots), the number of papers published by each journal (blue dots) in 2018–2019 and in 2020–2021 was comparable ($R = 0.98$; $P < 0.001$). When all journals (red and blue dots) were considered, the correlation index was 0.81 ($P < 0.001$). B Box-and-dot plot showing the relationship between the percentage of COVID-19 publications in the years 2020 and 2021 (*y*-axis) and the impact factor (IF) of the considered journals, grouped according to their IF quartiles (*x*-axis). First quartile = IF < 5; second quartile = IF ≥ 5–< 8; third quartile = IF ≥ 8–< 20; fourth quartile = IF ≥ 20.

Our preliminary observations, as well as other recent evidence,[5, 6] rather than being a systematic analysis of all the scientific works published during the pandemic, are intended to be a message of attention to a possible future scenario. Although further confirmation is needed about a possible adverse scientific wave, the experience gained during the COVID-19 pandemic should be an instructive lesson to help us be "better prepared" and "optimize" scientific research and diffusion also when the health-care system is under extreme strain.

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Author Contribution *Dr. Marenzi, Dr. Cosentino, and Dr. Chiesa had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Cosentino and Chiesa; acquisition of the data: Chiesa; analysis and interpretation of the data: Marenzi, Cosentino, and Chiesa; drafting of the manuscript: Cosentino and Chiesa; critical revision of the manuscript for important intellectual content: Marenzi; statistical analysis: Chiesa; administrative, technical, or material support: Chiesa; study supervision: Marenzi.*

Declarations:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

Disclosures: *None.*

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