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Global Scientific Output on Medical Education during the COVID-19 Pandemic

Abstract

The objective of the present study is to characterize the global scientific production on medical education during the COVID-19 pandemic in seven scientific databases from January 2020 to April 2021. We worked with a universe of 248 articles of which bibliometric indicators were analyzed using Publish or Perish software v. 7.19 and the same analytical software for the chosen databases. The results indicate an average of 39.5 citations. 27.95, 0.87 and 17.90 citations per year, citations per article and citations per author respectively. Among the most cited articles in the Scopus and Microsoft academic databases, Maintaining High-Quality Multidisciplinary Scholarship Programs in Pain Medicine stands out: Part I: Innovations in Education, Research, Candidate Selection Process, Wellness, and Implementation from ACGME during the COVID-19 pandemic. This article is also the second most cited article in the Web of Science database. These results show that the production of scientific articles on educational medicine in the context of the COVID-19 pandemic has not had a significant development.

Keywords: Bibliometrics, Scientific Production, COVID-19, Medical Education.

Introduction

Medical education is a matter of concern for any country that focuses its attention on improving the health conditions of its population. This has a direct impact on the social and cultural development of the nation since it must respond to changes in disease patterns and health dynamics that the world is experiencing. Changes in medical practice to respond to these needs should force both students and teachers to deepen their knowledge of clinical practice. Technological advances are not alien to any profession, and it is these that provide effective tools to improve the conditions that lead to

generations of useful knowledge. Medicine and in general all health professions are not the exception to the rule (Pinzón, 2008).

Medical education aims to optimize the development of professional competencies during undergraduate and postgraduate training of physicians (Sierra et al., 2009). The COVID-19 pandemic brought with it a series of measures aimed at preventing its contagion and spreading on the planet. Among them, the implementation of social distancing stands out, which has carried out face-to-face educational activities to be suspended indefinitely. This has led universities and higher institutions to restructure their study plans and the modalities

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of teaching and evaluation of the knowledge of their careers (specific case of Medicine) (García-Montalvo, 2021), which forced students to develop in learning environments for which neither they nor the teachers were prepared. The virtualization of education has received various criticisms. In the field of medicine, the concern arises from the fact that the development of the skills necessary for medical performance cannot be learned in virtual contexts since they require the presence of the patient.

Faced with the new reality, online evaluations were implemented, which raised concern about the lack of honesty and fairness in their development (De Witt, 2020). Since then, the routine of medical students, schools and educational institutions has been altered by the changes caused by the pandemic and the consequent measures of social distancing. These measures have interrupted clinical sessions and practices, so important for the training of future physicians, and have forced training institutions to adapt to new systems of medical education around the world (Papapanou et al., 2021). For Núñez-Cortez (2021):

In the current crisis caused by covid-19, education has distanced itself because the intervening agents have distanced themselves. Presence has disappeared, and academic activities have been compulsorily interrupted for numerous reasons: safety of one and the other, impossibility of practicing it due to lack of time, dedication to urgent sanitary tasks until exhaustion and confinement, sick leave.

In March 2020, the Association of American Medical Colleges (AAMC, 2020) decided to suspend clinical rotations. It also issued a guide for medical students to avoid activities that involve direct contact with the patient. These directives were assumed by various countries in which the introduction of new learning methods and strategies in medical education became a necessity. In an effort not to stop the teaching-learning process, universities and medical schools around the world have accelerated the development of the virtual learning environment (Joseph et al., 2020), showing important changes especially in the processes of learning. adaptability of students and teachers to the new context, the ability to reason, search for solutions and the vitality of scientific thinking in health professionals (González-García et al., 2020).

Bibliometric studies that have been found on medical education are scarce, and articles published in this area are usually descriptive, self-funded, or have low levels of interinstitutional collaboration (Baernstein et al., 2007; Doja et al., 2014). Nevertheless, there are some important studies to highlight. First, there is the research by Azer (2015), who identified and examined the characteristics of the 50 most

cited articles in medical education. Secondly, the study by Chaple-Gil et al. (2020), who analyzed 22 articles related to the evaluation of medical curricula, published in Cuban medical journals, stands out. On the other hand, Dorta-Contreras et al. (2019) worked exclusively with 850 results extracted from Scopus, corresponding to the period 2011-2015 using terms related to medical education and specifying that at least one author has an affiliation from a Latin American country. Maggio et al. (2021) analyzed 963 systematic reviews representing 3.1% of the total articles published ($n = 30,597$) in 14 core medical education journals, from 1999 to 2019. Finally, it is worth highlighting the study by Morán-Mariños et al. (2019), who found that in the period 2011-2015, 850 original medical education articles with authors from Latin America were published in Scopus, of which 49.1% had an author from Brazil.

From the beginning of the pandemic to the present, the scientific and health communities, together with the governments, are putting all their efforts into the control of the COVID-19 infection. The need to know how the virus works, its effects and how it can be fought has generated a large volume of information. The linear growth of world production indicates that the volume of work on COVID-19 has grown at a constant rate during the last two years (Torres & Torrell-Vallespín, 2020). Despite the tremendous barriers that the conditions of confinement have imposed on educators, the current period has been one of incredible evolution and powerful change, characterized by the development of a host of new and innovative ways to overcome and improve traditional conceptions of teaching and learning in health care. The literature on medical education in times of COVID-19 evidences this, in addition to the need to overcome the pandemic and its consequences in medical classrooms. Therefore, the present study aims to describe the scientific production in medical education published in journals indexed in six of the main world databases.

Material and Methods

The one followed in the present study is typical of bibliometric studies (Moreno, 2019; Campos et al., 2020). In order to quantify the global scientific production of research in medical education in COVID-19 times, the periods ranging from January 2020 to May 2021 were chosen. It is a descriptive, cross-sectional-retrospective bibliometric study. The basic tool in bibliometrics is the analysis of citations by counting them. Upon reviewing the databases chosen for this research--Scopus, Web of Science, Google Academic, PubMed, Microsoft Academic, Dimensions and Crossref--, bibliometric indicators were determined through

the Publish or Perish v. 7.33 software. The analytical software of the chosen databases was also used, in addition to Dimensions, PubMed and PubRe Miner. For the searches, the terms TI = (EDUCATION OR EDUCATIONAL * AND MEDICINE * AND COVID * AND 19) were used, which appear in the title of the investigation, since English has become the lingua franca of international research, the use of other languages could affect not only the visibility of scientific articles, but also the potential for citation (Van Leeuwen et al., 2001).

The selected articles were carefully reviewed and selected. After this, a final universe of 246 results related to the study topic was formed. The data obtained were exported to a

database (MS Excel from Microsoft Corp.) for analysis. After this process, figures were made with the help of the Vos Viewer program.

Results

Table 1 shows the scientometric indexes obtained from the analysis of the 248 articles. The average number of citations that stand out is 39.5; per year the average number of citations is 27.95; article citations are 0.87 and citations per author is 17.90. The publications on average have an h-Index of 3.17, a g-Index of 4.40 and a normal h-Index of 2.0.

Table 1.

Scientometric indicators of the analysis of articles on medical education

Source	Google Scholar	Microsoft Academic	PubMed	Crossref	Scopus	Web of Science
Articles	67	65	21	38	34	23
Citations	88	38		68	27	26
Years	2	1	1	1	1	1
Citations by years	44	38		68	27	26
Citations by article	1.31	0.58		1.79	0.79	1.13
Citations by author	24.18	8		30.33	27	
Articles by author	23.04	20.1	4.22	16.78	34	
Authors by article	3.79	5.08	6.38	2.21	1	
Index h	5	3		5	3	3.0
Index g	7	3		8	4	
Index hc	9	8		5	6	
Index hi	1.25	0.45		2.08	3	
Index h normal	2	1		4	3	

Regarding the articles most cited in the analyzed databases, the study by Lynn Kohan, Susan Moeschler, Boris Spektor, René Przkora, Christopher Sobey, Scott Brancolini, Sayed Wahezi and Magdalena Anitescu entitled "Maintaining high-quality multidisciplinary pain medicine fellowship programs" Part I: Innovations in pain fellows' education, research, applicant selection process, wellness, and ACGME implementation during the COVID-19 pandemic, published by Pain Medicine Journal in June 2020, stands out. The study focuses on analyzing the changes in the learning processes carried out in the scholarship programs awarded by the Governments. The educational context has undergone changes in its processes due to the COVID-19 pandemic, and scholarship programs have not been immune to this problem. The global health crisis has forced governments to modify their evaluation and selection processes for fellows. The authors conclude their study by proposing that innovative solutions be implemented to help overcome the challenges generated by the pandemic by

reviewing scholarship policies as well as improving the promotion of remote learning that help alleviate anxiety and mental health of the students. This article stands out as the most cited article in the Scopus database, second in the WoS database and also first in Microsoft Academic.

The Web Sciences database highlights the original article on medical education and e-learning during the COVID-19 pandemic in an African city by Ronald Olum, Linda Atulinda, Edwin Kigozi, Dianah Rhoda Nassozi, Alzan Mulekwa, Felix Bongomin and Sarah Kiguli published in the Journal of Medical Education and Curriculum Development (SAGE Journals), which received seven citations. The study focuses on the acceptance that e-learning has been having in the various academic institutions of middle-income countries, and the resources that have been made available for its implementation and assimilation as a mechanism for professional training. According to the study, middle-income countries do not have the necessary resources in terms of

infrastructure and professionals to implement these teaching-learning platforms. The study was based on the perceptions of medical students from 4 government-funded universities in Khartoum, Sudan.

Featured in the PubMed database is the original article on the perspectives of medical and surgical residents in the context of the COVID-19 pandemic by Tanvi Rana, Christopher Hackett, Timothy Quezada, Abhishek Chaturvedi, Veli Bakalov, Jody Leonardo and Sandeep Rana, published in Medical Education Online journal (Taylor & Francis Online) with three citations. The article is based on the authors' concern to understand the impact of COVID-19 on education and, above all, on the health of residents. The analysis focuses on obtaining information on the lifestyles and personal and professional development of residents in their daily activities, as well as opinions on the measures that this group would take to counteract the effects of the virus.

Finally, the letter to the editor entitled COVID-19: The Need for Continuing Medical Education and Training, prepared by Li Li, Qianghong Xv, Jing Yan and published in The Lancet Respiratory magazine ranks first in Crossref. The letter focuses on specifying the importance of the various specialties of medicine, its teams and professionals to face the pandemic. To do this, the authors suggest that medical programs should enhance the skills and knowledge of doctors.

Figures 1 and 2 show the journals with the greatest presence of analysis. Regarding the journals indexed in the Scopus database, AEM Education and Training predominates among them, while in Web of Science, Medicine General Internal stands out, in both cases with four publications. Academic Emergency Medicine (AEM) publishes research papers that focus on the practice, research, and educational advancements of emergency medicine. AEM is the second largest peer-reviewed scientific journal in the specialty of emergency medicine.

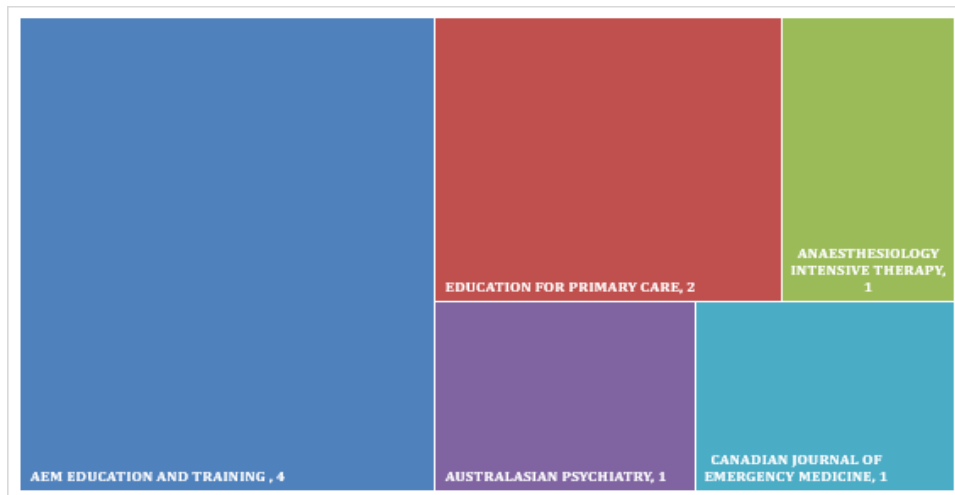


Figure 1.
Journals by provenance in the Scopus database



Figure 2.
Journals by provenance in the Web of Science database

Regarding the types of documents, original articles and letters to the editor are the scientific documents most frequently published in journals indexed in the Web of Science and Scopus databases, as shown in Figures 3 and 4. Original articles are the ideal documents to present full reports of research data. Its structure is suitable for various scientific areas. Letters to the editor communicate brief reports of original research data that the editors believe will be of interest to researchers. Authors such as Díaz-Chieng and Vitón-Castillo (2020) consider that “letters to the

editor constitute a fundamental piece in the process of generation, validation and evaluation of science”. The basic function of this type of document, in addition to presenting and commenting on original information, is to analyze published articles, pointing out strengths and weaknesses of a scientific article, as well as providing elements that can strengthen the article or highlight the topic. Since they are relatively short, letters to the editor are useful for scientists presenting research results that are time sensitive.

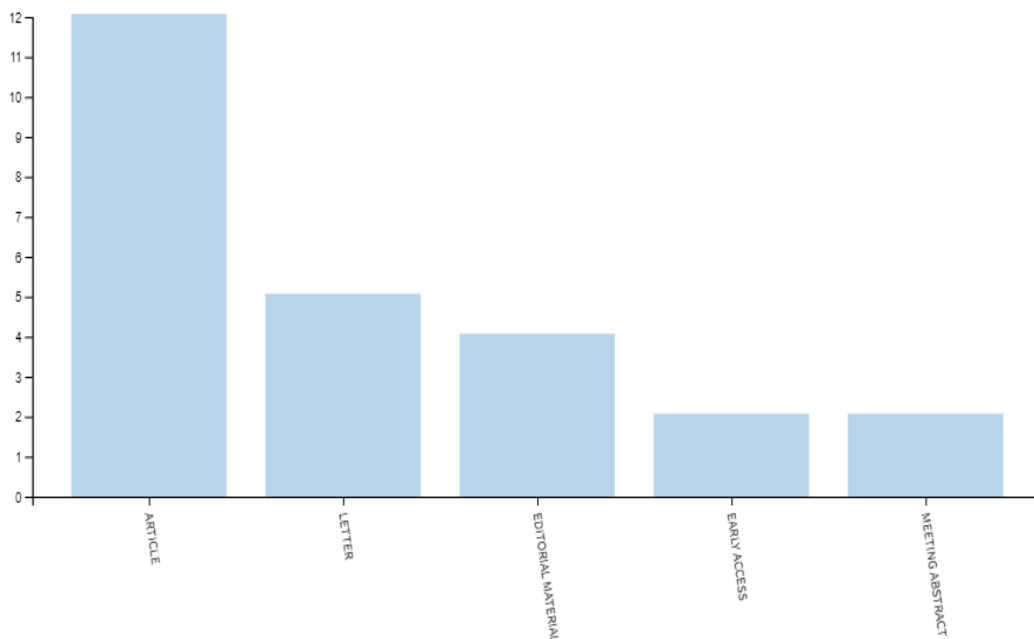


Figure 3.
Type of document in the Web of Science database

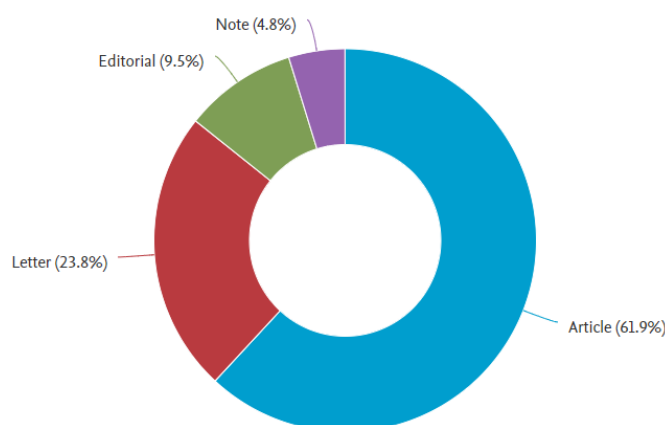


Figure 4.
Type of document in the Scopus database

As for the countries with the highest production of scientific papers on medical education published in journals indexed in the

Web of Science and Scopus databases, the United States predominates with 8 and 11 articles, respectively, while Belgium and Italy are

the countries with the lowest scientific production on the subject, as shown in Figures 5 and 6.

Likewise, it is important to highlight the data obtained from Scimago Journal & Country Rank upto the year 2020, in which the US ranks first in

the scientific production indexed in Scopus in the field of education with 335,246 articles. It is followed by the United Kingdom with 86,431 and Australia with 47,502 articles.

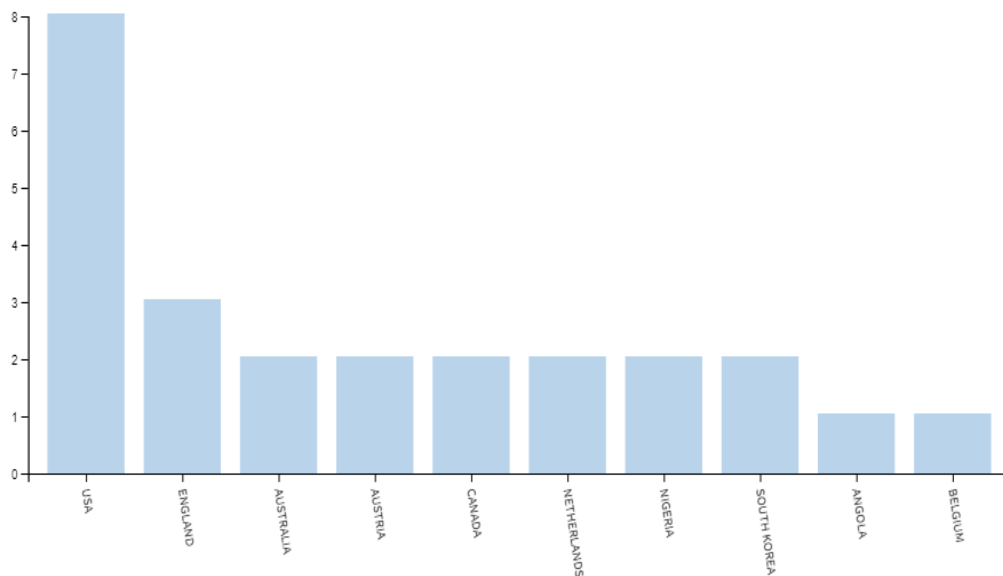


Figure 5.
Countries of origin in the Web of Science base

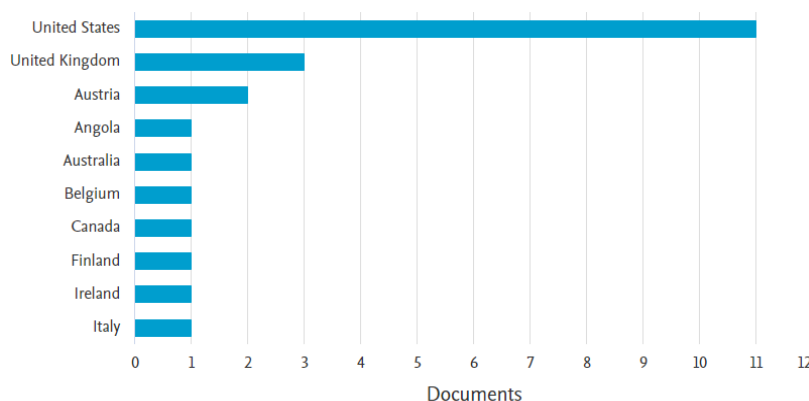


Figure 6.
Countries of origin in the Scopus database

Conclusions

In these new contexts, education must provide differentiated attention to the student. It is evident that traditional teaching no longer meets their academic needs, so it is urgent that teachers be trained in the changes that academic literacy entail. Thus, technological tools and elements of digital culture must be part of the life of the modern teacher (Fernández-Batanero, 2018; Cabero & Ruiz-Palmero, 2018).

The challenges posed by the COVID-19 pandemic to medical education in the world have

forced universities and society to respond to it, not as a threat but as a learning opportunity for students, from the early stages of their training. This response can help in the fight against the pandemic. For Hernández et al. (2021):

The implementation of virtual teaching represents a challenge for university authorities, teachers and students, due to certain measures necessary for its proper application: the availability of the internet, the appropriate environment for studying at home, the management of virtual platforms by teachers and students, the teacher’s ability to teach distance courses, the university’s academic technological

support and the teaching content adapted to virtual teaching.

Unlike other careers, health careers require a much more active participation in the development of career skills. Clinical interaction with the patient has perhaps been the activity that has been most affected in this pandemic. Visits and rounds with other students have been limited, as well as the supervision of teachers in this process. The direct evaluation of the patient has not been developing smoothly. The development of soft skills such as empathy, teamwork in others have been replaced with virtual activities. All these facts are required for the training entities to reflect on the profile of the doctor in times of pandemic.

Regarding the publication with the highest number of citations, the study by Kohan and his collaborators on high-quality multidisciplinary scholarship programs, published by the journal *Pain Medicine* in June 2020, appears in the Scopus database, second in the Web of Science database and first in Microsoft Academic.

As for journals publishing research on medical education, *AEM Education and Training* stands out in the Scopus database, while *Medicine General Internal* stands out in the Web of Science database, in both cases with four publications. In Azer's study (2015), most of the articles on medical education were published in the journals *Academic Medicine* (34; 60.7%) and *Medical Education* (16; 28.6%); while for Maggio et al. (2021) the journal *Medical Education* is the medium with the highest number of published knowledge syntheses (n = 189; 19%). Morán-Mariños et al. (2019), meanwhile, highlight *BMJ* as the journal with the most publications (13), followed by *Interface* (12). On the other hand, Sampson et al. (2013) indicate that the journals *Academic Medicine*, *Medical Education*, *Medical Teacher*, *Teaching and Learning in Medicine* and *Journal of Continuing Education in the Health Professions* have the highest number of publications on medical education.

In the present research, it was found that the types of research that predominate in the Scopus, PubMed and Web of Science databases are original scientific articles. Sweileh (2021), in his search on e-learning in health sciences education, found 4576 documents, the majority (n = 3885, 84.9%) original articles, while the remaining documents were reviews, notes, letters, editorials, conference papers and short surveys.

The present research determined that the USA is the country with the highest scientific production on medical education in the Scopus and Web of Science database with 8 and 11 articles, respectively. Sweileh (2021) concluded that 39.0% (n = 48) of the countries contributed 10 or more papers, while 20 (16.3%) countries

contributed only one paper. The majority of the publications came from the USA (n = 1407, 30.7%), followed by the UK (n = 795, 17.4%).

The selected publications and databases constitute a more than representative sample of international research on the subject. It is suggested to increase international collaboration in research on medical education, as well as the strengthening of this line of study with the financial support of governments. Journal editors must also follow open access policies on articles related to medical education to allow academics and researchers to have free access to published articles (Sweileh, 2021). Likewise, it is suggested to develop more research on the results obtained with the incorporation of new technologies in the field of teaching in medical schools around the world. In the words of Alemán et al. (2020):

The need to prepare future healthcare professionals has never been more focused as it is now in the context of a global emergency and its impact on our society. The effects of COVID-19 can forever change the education of future professionals. With this pandemic, medical education and the way we relate will change and we must adapt.

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