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ORIGINAL ARTICLE

Scientometric evaluation of scientific publications on children with COVID-19

Daniel Borges Barbosa¹, Anne Caroline Lucas Brandelero¹, Vinícius da Silva Oliveira¹, Lucas Rodrigues dos Santos¹, Alexandre Martins Araújo¹, Emilly Santos Oliveira², Cristiane Simões Bento de-Souza¹, Renata Machado Pinto¹

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Abstract

Objectives: To perform a scientometric review of the world literature that is related to the infection of SARS-CoV-2 virus in the pediatric population. **Methods:** The Elseviers Scopus database was used to the research of the keywords Covid* AND child*, in the period between 01/01 to 25/06/2020. The documents were classified according to the studies areas, types of research, financing, country of origin, periodic and institutional affiliation of the researchers. **Results:** 826 documents were published, from which 34.5% had some kind of foment. Its observed the predominance of publications coming from countries that become the epicenters of the SARS-CoV-2 pandemic, highlighting China, United States, Italy, and United Kingdom. Brazil was in the tenth place on worldwide ranking with 26 publications, 26.9% from that having financing. The predominance of publications is in the medical area both in Brazil and in the world. **Conclusion:** The big amount of researches published about COVID-19 in children in the short period comprehended between the emergency of the pandemic and nowadays shows the fastness of knowledge generation and the importance of the theme to public health. The analysis of information about Brazil reveals that, even being the second country of cases and deaths, the country represents only 3.14% of the researches about COVID-19 in children, and assumes a leadership position of the scientific publications about the theme in Latin America.

¹ Federal University of Goiás, School of Medicine - Goiânia - Goiás - Brazil.

² Federal University of Goiás, School of Nutrition - Goiânia - Goiás - Brazil.

Correspondence to:

Daniel Borges Barbosa.

Universidade Federal de Goiás. R. 235, s/n - Setor Leste Universitário, Goiânia - GO, Brasil. CEP: 74605-050. E-mail: danielgyn25@gmail.com



INTRODUCTION

Infectious diseases have permeated human history and demanded collective efforts to control it. In the current context, despite medical advances, COVID-19 caused by the SARS-CoV2 virus has spread rapidly. The virus was identified in 2019 in the city of Wuhan, China as a cause of potentially serious respiratory disease^{1,2,3}. Subsequently, it spread to other regions, being classified, in January 2020, as a Public Health Emergency of International Importance by the World Health Organization (WHO). However, the cases of the disease continued to increase and reached several countries, representing a threat to the lives of thousands of people. On March 11, 2020, COVID-19 was characterized by the WHO as a pandemic⁴.

This condition affects men and women of all age groups. However, according to preliminary studies, it appears that children have a milder clinical outcome from COVID-19 when compared to adults and the elderly. The hypotheses are that inflammatory cytokines contribute to the viral sepsis. Thus, as the cellular and humoral immune systems of children is less developed, there is no exacerbated inflammatory response. However, even among children, there are groups at a higher risk of developing severe conditions such as children under 2 years of age, with chronic lung diseases, heart disease, diabetics, immunosuppressed and patients with renal failure⁵.

The clinical outcome in children varies between mild, moderate, severe or critical. The mild condition presents unspecific symptoms of upper airway involvement, or gastrointestinal symptoms, differing from the moderate one, that affects the lower respiratory tract without signs of severity. On the other hand, the severe condition is the evolution to severe pneumonia with cough or difficulty breathing, in addition to at least one of the following signs: central cyanosis or SpO₂ <90% to 92%; signs of respiratory distress or warnings such as inability to breastfeed or drink, lethargy, unconsciousness or seizures⁶.

Critical conditions are characterized by severe acute respiratory syndrome with proven oxygenation impairment. The dysfunction of other organs can also be considered critical, representing a proven risk of death⁶. This dysfunction may even be a neurological impairment, in addition to complications such as encephalopathy, acute cerebrovascular diseases and loss of consciousness^{7,8}. Some patients have recently reported to have a multisystem inflammatory syndrome, with clinical manifestations and changes in complementary tests, similar to those seen in children and adolescents with Kawasaki syndrome, incomplete Kawasaki syndrome and/or toxic shock syndrome⁹.

In addition, COVID-19 also represents damage to children's mental health. This results in a complete change in their lives, with suspension of classes and social interaction restricted to their family circle, conferring a high level of stress. These situations raise cortisol and adrenaline, with consequent cardiovascular system overload and risks to the healthy built of the children's brain architecture. This can have several short-term consequences, such as sleep disorders, irritability, worsening immunity, fears; and in the

medium and long terms, a higher prevalence of developmental delays, anxiety disorder, depression, drop in school performance and unhealthy lifestyle during adulthood¹⁰.

Despite the efforts of the international scientific community to discover treatments and prevention for the disease, effective drugs and vaccines are not yet available. Thus, the world has an increasing number of cases and deaths, even among children. In addition, there are still several questions regarding the manifestations of the disease and its repercussions in pediatric patients¹¹.

Therefore, this paper is justified by the need to collect data on which studies about COVID-19 in children have already been published, identifying the designs used, their approaches, populations, environments, socioeconomic conditions, scope, limitations, among other characteristics, which enable the identification of knowledge gaps about the disease, guiding researchers to fill them. The objective of this study is to carry out a scientometric analysis of the world literature about SARS-CoV2 virus infection in children.

METHODOLOGY

We ran a scientometric survey of the scientific literature about SARS-CoV2 infection in children. We analyzed journals and publications indexed in the Elsevier's Scopus database from remote access on the CAPES/MEC platform. The search included scientific publications dated until June 25, 2020. We used the following keywords: Covid * AND child * (the * allows to include variations of the terms).

All publications were analyzed using scientometric methods, and they were later classified by study field, type of published research, funding, country, periodical and institutional affiliation of researchers in Brazil and worldwide. These data were then tabulated and organized into Microsoft Excel 2010 charts.

RESULTS

In the period from 01/01 to 25/06/2020, there were 826 documents published focusing on COVID-19 in children. The publications' journals were mostly in the medical field, followed by journals in the areas of immunology and microbiology. As for the type of study, we included papers and reviews (figure 1). In geographic analysis, the continents or subcontinents with the largest number of publications were Europe, Asia and North America, with studies being mainly from China (25.18%), United States (20.58%), Italy (12.83%) and the United Kingdom (11.74%) (figure 2). On the other hand, South America and Africa came in the last places. In relation to funding, 34.5% (n = 285) of the world research received funding from government agencies and such organizations, with the following institutions standing out: China National Foundation for Natural Sciences (China, n = 27), National Institutes of Health (United States, n = 14) and National Institute for Health Research (United Kingdom, n = 8). Next in the funding ranking are non-profit organizations: The Bill and Melinda Gates foundation (n = 7) and the Wellcome Trust (n = 7) 12.

The journals with the largest number of contributions in the field were the “Journal of Clinical Virology” (Netherlands) and the “Journal of Medical Virology” (United States). As for authorship, the main affiliation institutions of the researchers are: Tongji Medical College (China), Huazhong University of Science and Technology (China), University College London (United Kingdom) and Harvard Medical School (United States) (figure 3)¹².

In Brazil, the Latin American country with the largest number of studies, there were 26 documents on the topic. Of the total number of publications, 10 (38.46%) were articles; 8 (30.76%) were reviews; 5 (19.23%) were notes; 2 (7.69%) were editorials and 1 (3.84%) was a letter. The main publication journals were “Clinics” (Brazil), “Pediatric Pulmonology” (United States) and “Cadernos De Saúde Pública” (Brazil). Regarding the classification of publication journals, 76.92% were medical, followed by dental, with 7.69%¹².

The authors were mainly affiliated with the following institutions: Universidade de São Paulo and Fundação Oswaldo Cruz (figure 4). Only seven Brazilian papers (26.92%) were funded, four of which were financed by the National Council for Scientific and Technological Development (CNPQ) and three by the Coordination for the Improvement of Higher Education Personnel (CAPES)¹².

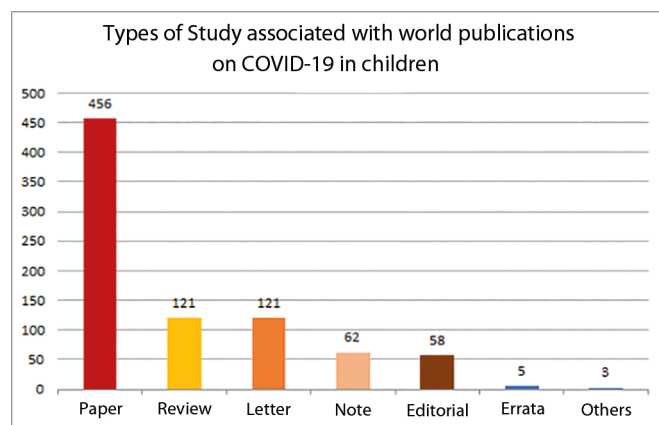


Figure 1. Types of research referring to worldwide publications on COVID-19 in children from 01/01 to 06/25/2020.

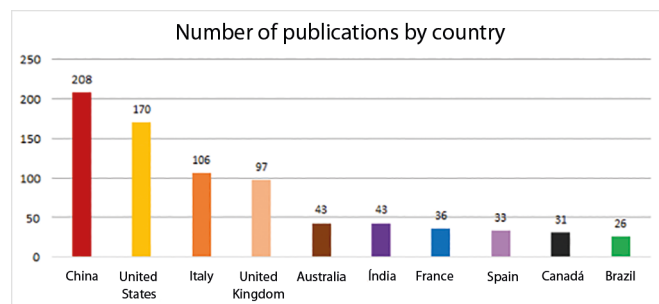


Figure 2. Number of publications about COVID-19 in children by country, in the period from 01/01 to 06/25/2020.

DISCUSSION

Scientometrics emerged in the former Union of Soviet Socialist Republics and in Europe, being used mainly in Hungary¹³. It is characterized as a branch of science dedicated to the study of the measurement and quantification of scientific progress. Science and information are advancing, thanks to the research and the dissemination of knowledge, being processed in different support media¹⁴. Through scientometric work, it has become possible to follow the breadth and nature of research activities developed in different areas of knowledge in different countries, institutions and among different researchers. Thus, in a major pandemic such as COVID-19, this analysis of scientific production on the subject worldwide is extremely necessary, identifying, through numbers, the path, evolution and breadth of this research¹⁵.

The large amount of published research on COVID-19 in children in the short time between the emergence of the pandemic and the current moment demonstrates the speed in generating knowledge and the importance of the topic for public health. The journals in these publications focus on the medical field, showing an effort in the clinical understanding and management of this pathology in pediatric patients. Then, the area of immunology and microbiology stands out, focusing on the pathophysiological and molecular aspects, that is, the bases of the health-disease process. Thus, there is a complementarity between basic and applied science, contributing to the evolution of knowledge about the disease. In this context,

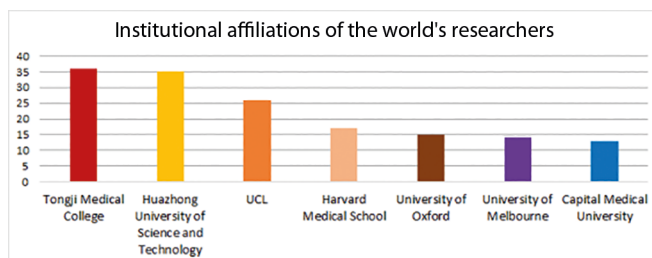


Figure 3. Institutional affiliation of worldwide publications on COVID-19 in children, from 01/01 to 06/25/2020.

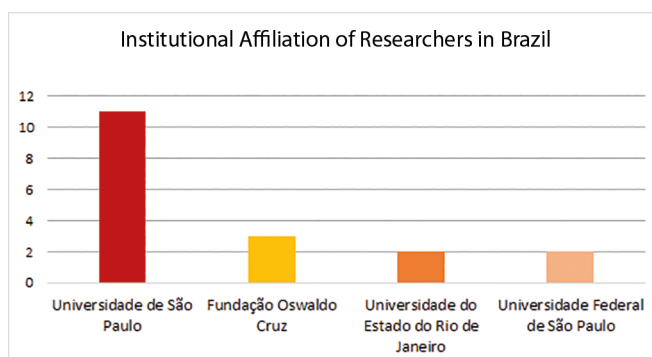


Figure 4. Institutional affiliation of Brazilian publications on COVID-19 in children, from 01/01 to 06/25/2020.

the unprecedented character justifies the predominance of articles being followed by reviews that seek to summarize and compare this large volume of information.

The distribution of publications by country, in turn, shows that epicenters of the pandemic led the research. Therefore, the United States, the country with the highest number of cases and deaths, is preceded only by China, where the first cases of COVID-19 were registered. In addition, the positioning of the countries in the ranking assessed in the present study - China followed by the United States, Italy and the United Kingdom with the largest number of studies - reflects their structural aspects concerning the encouragement and promotion of science. In this sense, we also report that the state incentive is the main responsible for funding. However, there is a significant participation of non-profit institutions, especially the Bill and Melinda Gates Foundation and the Wellcome Trust, reflecting the growing participation of this segment in strategies to contain the effects of the pandemic¹¹.

Analysis of the information referring to Brazil reveals that, despite being the second with the highest number of cases, the country represents only 3.14% of the research on COVID-19 in children. In this context, 26.9% (7 articles) of national publications were funded, a number well below the world average of 34.5%. In addition, Brazilian funding comes mainly from public institutions - CNPQ and CAPES; this demonstrates the difficulties in conducting research in the country and its low incentive. Despite this, Brazil is the only Latin American country to participate in the ranking of countries that have published the most about the subject studied.

As for the field of journals in Brazilian publications, the predominance is in medical and dental journals, traditionally related to applied research. This difference in relation to the world context, which has the immunology field as second in number of publications, probably because these researches require high investment and high-tech laboratory infrastructure, making it difficult to carry out in the country. Furthermore, Brazil had an increase in cases at a late stage when compared to China, the United States and Europe¹¹. Therefore, existing research in the basic area may have started later and has not yet been completed. The authors' institutional affiliation reveals the role of São Paulo on the national scene. The state was the first epicenter of the disease in the country and concentrates the largest number of cases; in addition, it has important institutions and scientific centers - factors that contributed to this¹⁶.

In relation to the continents, Africa and South America occupy the last places in the list of publications. This occurs not only in relation to publications on COVID-19, but also with publications in general, reflecting the lack of basic research structure in these continents. In addition, there is a polarization of research in certain countries, in Africa 31.42% of publications are from South Africa, while in South America 66.6% are from Brazil¹⁷.

Scientific research is, in general, what systematizes the phenomena of the real world so that it is possible to understand and interfere. Thus, Brazil is an important territory for research on COVID-19 in children. This is because it is the 2nd country in number of confirmed cases and has an upward contamination curve¹¹. In this context, this research demonstrates that there are still knowledge gaps about the disease, requiring the incentive and investment in research in the country to formulate guided and scientifically based public policies.

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