Original Article


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Abstract

Background: The COVID-19 pandemic has triggered a large number of publications to inform, understand, conduct more research and control the situation. Although the researchers are analyzing the bibliometrics on this condition, no bibliometric studies are available on the publications related to post-covid mucormycosis. This study is aimed at bibliometric assessment of the publications related to post-covid mucormycosis.

Methods: In the presented study, authors have performed the bibliometric analysis of the World health organization (WHO) database named ‘Global literature on coronavirus disease.’ WHO is maintaining this database since the pandemic, and it contains thousands of reports. Two simple search terms, ‘Covid’ and ‘mucormycosis’ used to search the entire database in ‘title, abstract, subject’ mode with the search string was tw:(mucormycosis covid). The search was not restricted to any date range.

Results: Only 51 reports (40 articles and 01 clinical trials) were obtained with the above search terms. The study found that there is considerable growth in such publication in the last 6 months. Interestingly only three such reports were published in the year 2020. Database wise 38 of these 51 reports were available in Medline. Most of such reports were published by Indian authors. Indian Journal of Ophthalmology emerged as the most productive journal contributing the highest number (10) of these reports.

Conclusions: The highly acclaimed publications were the reviews. This study suggests that India is the most productive country for publications related to post-covid mucormycosis. This resembles the fact that the country, faced the excessive emergence of post-covid-19 mucormycosis cases reported the second-highest number of Covid 19 cases in the substantial worldwide outbreak in the second wave, which is followed by post covid mucormycosis.

Keywords: Bibliometrics; COVID-19; Post-Covid; Mucormycosis; WHO COVID-19 Database.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), popularly known as Covid-19, is associated with an array of opportunistic bacterial and fungal infections1. The use of immunosuppressants, including steroidal therapy, is widespread in the early stage of infection, and it is used to prevent and treat the period of high inflammation of COVID-19. This also diminishes the host immune response to the microorganisms and provides an excellent opportunity for the other bacterial and fungal infections2. Recently, there is a severe emergence of mucormycosis in patients with COVID-19 has been reported more and more all over the world, especially in India (majority rhino-orbital-cerebral mucormycosis (ROCM))3. Mucormycosis is an invasive vascular fungus, usually found in the environment, growing on moist surfaces and dead and decaying plant matter. The primary reasons for the emergence of mucormycosis infection include immunocompromised host, diabetes mellitus associated hyperglycemia, etc.

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There are many studies published recently that report the emergence of post-covid 19 mucormycosis infection. However, the characteristics and impact of these studies are still lacking. In this sense, bibliometric analysis is a systematic tool for monitoring research in this field, providing veterans and new scientists with an overview of the scientific landscape in this field.

**Methods**

**Database Selection**

World health organization (WHO) database named as ‘Global literature on coronavirus disease’ which is a comprehensive collection on Covid 19 related research including clinical trials. It included the citations form of all the other relevant databases such as Medline and Scopus. Two simple search terms, ‘Covid’ and ‘mucormycosis’ used to search the entire database in ‘title, abstract, subject’ mode with the search string was tw:(mucormycosis covid). The search was not restricted to any date range. Data collection was acquired from July 30 to August 5, 2021.

**Data Export and Analysis**

The information retrieved from the Global literature on coronavirus disease database was exported to Microsoft Excel®. Later, software VOSviewer 1.6.13 was used for visualization and data analysis.

**Bibliometric Indicators**

The following bibliometric indicators were evaluated:

- Volume and growth of publications related to covid 19 related mucormycosis.
- Co-occurrence keywords network visualization.
- Co-occurrence keywords overlay visualization.
- Most active countries.

**Results and Discussion**

A total of 51 documents dedicated to covid 19 related mucormycosis were retrieved from the WHO database. Most of these articles (38 out of 51) are available in the Medline. A large number of these reports (50 out of 51) were published in the year 2021. The emergence of post-covid-19 mucormycosis-related publications is depicted in Figure1. The initial publication related to post covid-19 mucormycosis emerged as early as in the mid of 2020. The report suggested the possibilities for fungal infections

![Graph showing emergence of post-covid-19 mucormycosis-related publications.](image1)

**Figure 1:** Emergence of post-covid-19 mucormycosis-related publications. Note: The date of entry into the WHO database is considered for preparing this graph.

![Geographical representation in post-covid-19 mucormycosis-related publications.](image2)

**Figure 2:** Geographical representation in post-covid-19 mucormycosis-related publications.
Figure 3: Figure 3 shows the research topic map in network visualization, overlay visualization mode, and density visualization, which displays the five clusters of relevant research topics concerning the post covid-19 mucormycosis. The most significant nodes in the network are Covid-19, SARS-Cov-2, mucormycosis diagnosis, humans followed by drug therapy, antifungal agents. Furthermore, a significant number of studies were focused on orbital disease diagnosis and therapy. The WHO database reflects the maximum number of reports related to Rhino-ocular-cerebral infections.11-20

Conclusion
Studies related to covid-19 associate invasive mucormycosis have been continuously rising from mid-2020 to the present time. Most of these studies were focused mainly on orbital diseases, eye infections, diabetes-related complications, paranasal sinuses. The other studies reported complications are endophthalmitis, ophthalmoplegia, and post-operative complications. India, followed by China, and the USA, were the more productive country on studies related to post covid-19 mucormycosis, and they also had the most substantial collaboration network.

Limitations and Future Recommendation
There is currently minimal data available regarding post-Covid mucormycosis, and most of the studies are published as case reports due to the concise history of the disease. Although these reports are continuously growing, the collaboration network is somewhat weak. There is a great need to strengthen scientific cooperation to solve this global health problem and ensure successful treatment strategies.

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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

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AUTHOR CONTRIBUTIONS
All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.
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