

## Black Fungus and Covid19 What we Know Today in the Americas

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### Abstract

**Background;** The pandemic given by COVID19 has represented a great challenge for the scientific and political community around the world, nobody even imagined the magnitude that such a disease would have, much less it was thought that this entity was going to give rise to other infectious diseases on aggregate such as In the case of Black Mushroom, in this section we will study the degree of commitment of this emerging disease that little or nothing was heard about and its relationship with COVID19.

**Methodology;** A narrative review was carried out in different indexed journals and others using keywords such as black fungus, mucormycosis, COVID19, in order to obtain original and review articles whose content would provide updated information and great scientific content. Initially, 30 articles were obtained, but after applying our inclusion and exclusion criteria, 14 were selected, of which we collected the most applicable and relevant information possible.

**Results;** Mucormycosis or black fungus is an opportunistic fungal infection that greatly affects individuals with COVID19 and can reach up to 30% mortality in these patients.

Since it is an opportunistic disease, patients must have an underlying disease which in most cases is poorly controlled diabetes, diabetic ketoacidosis states, hematological malignancies or treatments with high glucocorticoid loads.

**Conclusion;** The following review offers up-to-date information about what is known about Black Fungus disease and its relationship with COVID19, clinical presentation, as well as triggers, diagnostic guidance, and indicated medical management.

**Keywords:** Covid 19; Black fungus; Mucormycosis

### Introduction

Mucormycosis or black fungus is an opportunistic fungal infection of which little or nothing was heard of, but from the pandemic generated by COVID19 there has been greater knowledge given the high percentage of mortality that individuals who suffer from it may have. within hospitalization for COVID19, which can reach more than 30% depending on the clinical presentation. The etiological agents responsible for this entity are part of different groups of fungi within which three genera stand out, which are isolated more frequently in human infections, which are; Rhizopus, Mucor, and Rhizomucor [1].

### Materials and methods

A narrative review was carried out, in which the databases of PubMed, Scielo and ScienceDirect, Google Scholar, among others, were searched. As keywords, the following terms were used in the databases according to the DeCS and MeSH methodology: black fungus, mucormycosis, COVID19. In this review, approximately 30 publications were identified between originals and review publications related to the subject studied, of which 12 articles met the inclusion requirements required by us, articles whose publication was as up-to-date as possible, which were full-text articles. , which will raise at least one of the aspects of the subject studied, and articles that will inform about the current problem of black fungus and COVID19. As exclusion criteria, it was taken into account that the articles did not have enough information and that they did not present the full text at the time of their review.

### Origin and development of the disease

The challenge of this over-aggregated disease came from India, where the first cases were diagnosed that later showed a significant increase, so much so that some experts estimate that the total number of these by the end of June 2021 was around

40,845 cases in that alone. country. Studies Retrospective studies carried out in the same region showed an incidence of approximately 0.27% and 1.6% of Mucormycosis in hospitalized patients in general stay and ICU, respectively. The arrival in South America initially occurred in Uruguay, which was the first country to diagnose the disease in the region, his patient had a recent history of covid19 and diabetes mellitus, the next countries where the entity was diagnosed were Chile and Brazil, which at the beginning of June 2021 already had 29 confirmed cases, which set the alarms in the other Latin American countries to have the Black Fungus as a differential diagnosis [2, 3,4,5].

These microorganisms have special pathogenic characteristics, for example the Rhizopus has within its arsenal the enzyme ketone reductase, which allows it to grow more easily in an acidic environment with a high glucose content, that is, those diabetic patients and even more those who develop diabetic ketoacidosis are very susceptible to infection [6].

In addition to diabetes mellitus, there are multiple underlying diseases that predispose the individual to develop the infection, some of these are:

- Long-term or high-dose glucocorticoid treatment
- Hematologic malignancies or AIDS
- Treatment with deferoxamine
- Malnutrition or COVID19

Covid19 is a disease that particularly brings together multiple conditions that favor infection by Black Fungus, initially it generates a state of hypoxemia in the body which is used by the spores to lodge in the turbinates, to From here, an angioinvasion begins reaching the paranasal sinuses, orbit and brain, generating the most common clinical presentation called rhino-orbito-cerebral Mucormycosis [7].

In addition to the state of hypoxemia, the individual with a diagnosis of covid19 presents metabolic alterations such as hyperglycemia and in some cases a state of metabolic acidosis typical of the natural history of the disease, conditions that, as we saw, increase the pathogenic capacity of the fungus, the presence of high concentrations of iron in the serum, which can be absorbed by the fungus, stimulating its growth and greater tissue invasion, leading to infarction of the affected tissues [8, 9].

But the relationship between covid19 and black fungus goes beyond a state within the natural history of the disease, since this entity also affects those patients who are in remission period after suffering from covid19, that is, patients who are they keep in good metabolic control. In these individuals, the main risk factor associated with fungal infection is glucocorticoid therapy, which is used regularly in patients infected with COVID19.

In western countries such as India, it has been shown that of the total number of patients diagnosed with Mucormycosis and COVID19 simultaneously, more than 60% have a pre-existing diagnosis of diabetes mellitus and those patients infected with Black Fungus post COVID19 more than 50% were treated with

glucocorticoids and even studies indicate that this drug was applied up to 76% of affected patients [2,10].

In this section we will speak with relevance of the two clinical presentations of Mucormycosis associated with a positive COVID19 patient. Rhino-orbito-cerebral Mucormycosis is the most common presentation with up to 90% of cases, following its infection mechanism after the removal of the spores in the turbinates and migration to the paranasal sinuses, an acute sinusitis will present, accompanied by fever (44%), headache (26%), nasal congestion, purulent nasal discharge. With an evolution of days and through angioinvasion, the infection reaches the palate, necrotizing, presenting signs such as palatal eschar, perinasal edema, erythema and cyanosis of the facial skin that covers the sinuses (34%) [9].

Once the spread reaches the orbit, the most common signs are periorbital edema, blindness (30%), proptosis.

Pulmonary Mucormycosis is usually a less frequent clinical manifestation in patients with Black Fungus, infection at this level takes place when the spores are inhaled and reach the alveoli and bronchi of an individual predisposed by an underlying disease, mainly those with hematological neoplasms. . The most frequent signs and symptoms are fever, accompanied by hemoptysis that can lead to massive, chest pain, dyspnea [10].

There are another number of clinical presentations of Mucormycosis little associated with patients with COVID19, but it is essential to mention them; o Gastrointestinal mucormycosis, cutaneous mucormycosis, renal mucormycosis, isolated CNS disease and disseminated mucormycosis.

The diagnosis of Mucormycosis is based on clinical criteria (previously described) aided by complementary paraclinical tests such as MRI, CT of the paranasal sinuses plus chest X-ray. The histopathological findings through biopsies of affected tissue where non-septate hyphae of the fungi are evidenced in sections of tissues stained with Hematoxylin-eosin, among other stains. The cultivation of these fungi is carried out on sabouraud glucose agar and brain and heart infusion agar.

However, the most recommended option to support the diagnosis of the infection is the histopathological finding of the typical structures of the fungus, since the cultures do not always generate growth.

Mucormycosis treatment should be initially focused on correcting or controlling the underlying disease, that is, hyperglycemia, CAD. After this, a correct debridement of the necrotic tissue must be carried out, accompanied by the surgical team, antifungal management, the most recommended drug is amphotericin B at a usual initial dose of 5mg per kg day. Some reviews recommend graduated or complementary therapies with posaconazole or isavuconazole.

## Conclusions

- Mucormycosis or black fungus is an opportunistic and life-threatening fungal disease for patients with poorly controlled underlying diseases.

- The most frequent clinical presentation of Mucormycosis in patients with COVID19 is rhino-orbito-cerebral and this can vary from simple sinusitis, through necrosis of the palate to spreading to the orbital region and causing permanent blindness.
- The diagnosis is based mainly on the clinic supported by histopathological findings through biopsy of the affected tissue.
- Management is based on the control of the underlying disease, debridement of the necrotic and antifungal tissue.

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