

## Outbreak of Black Fungus after COVID-19: A Review

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**Abstract:** A life-threatening fungal infection has rise that further exacerbates the terrible circumstances of the COVID-19 pandemic in India and nearby South Asian countries. The fungal infection more commonly being referred to as black fungus (Mucormycosis) infection due to its blackening effect on the skin, is on the rise amongst patients affected with or recovering from COVID-19. India has already reported the highest occurrence of mucormycosis in the world. As of June 28, 2021, India has reported 40,845 cases of black fungus, with the highest reported cases in Gujarat and Maharashtra. Also, the country reported 3,129 related deaths till June 28, 2021.

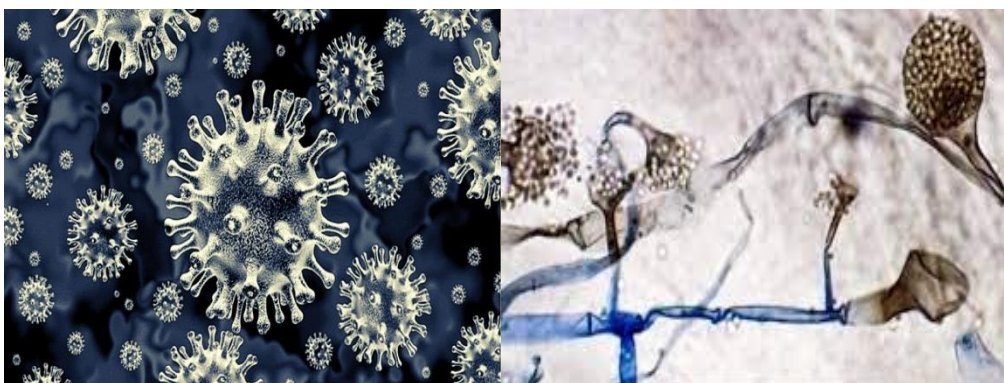
**Keywords:** Black fungus (Mucormycosis), Post Covid-19 & phagocytosis.

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## INTRODUCTION

Until recently, hardly anybody would have heard the name that such a virus would come which would prove to be fatal for the entire human species by becoming an incomprehensible puzzle [1, 2]. Mucormycosis (also called zygomycosis) is a grave but rare fungal infection caused by a group of molds called mucormycetes. These molds live all through the

environment. Mucormycosis mostly affects people who have already co-morbidities health risk or take medicines that lower the body's ability to brawl germs and sickness. It most commonly affects the sinuses or the lungs after inhaling fungal spores from the air. It can also occur on the skin after a cut, burn, or other type of skin injury [3].



Black fungus

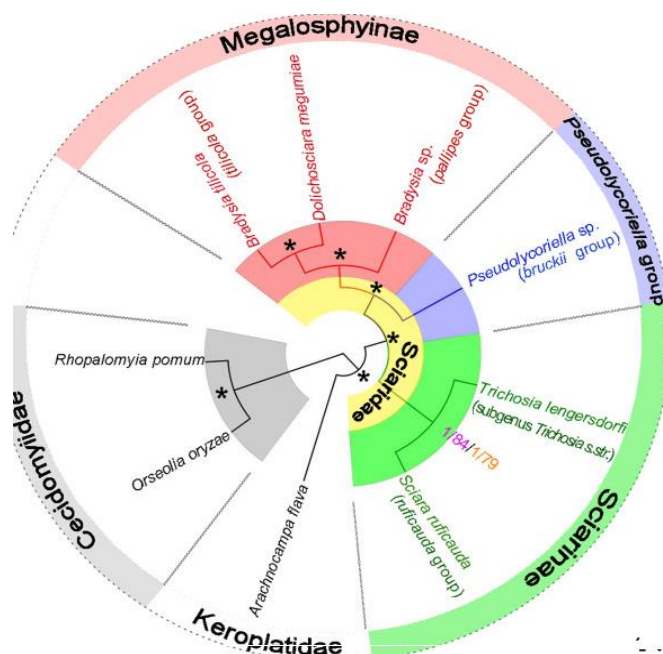
**Types of mucormycosis [5-9]**

- ❖ **Rhinocerebral (sinus and brain) mucormycosis**
- ❖ **Pulmonary (lung) mucormycosis**
- ❖ **Gastrointestinal mucormycosis**
- ❖ **Cutaneous (skin) mucormycosis**
- ❖ **Disseminated mucormycosis**

**Phylogenetic View**

Zygomycetes are the fungi class which causes fatal infection generally known as zygomycoses and both the Mucorales and Entomophthorales are belonging to zygomycetes class of fungi. Rhizopus, Mucor, Absidia and Cunninghamella are the genus which comes under Mucorales and Conidiobolus and

Basidiobolus are the two genera belong to Entomophthorales. Most of the human fungal infection caused by Mucorales fungi, hence mucormycosis and zygomycosis are interchangeably used. Among all these pathogens, highly pathogenic and mainly disease-causing pathogen is Rhizopus oryzae [10].



**Risk factor**

COVID-19 patients normally suffer from a decreased level of lymphocytes, mainly helper T-cells and cytotoxic T-cells. These cells play a fundamental role in the inflammation-mediated immune response of the body, and their reduced level makes COVID-19 patients extremely susceptible to secondary bacterial and fungal infections [11]. The major risk factors are as follow:

- Severe Covid -19 patient (< 6weeks).
- Uncontrolled Diabetes

- Chronic granulomatous
- Primary immuno deficiency
- Renal failure
- Prolong use of corticosteroid drug therapy
- Use of Immuno- suppressive drug like Tocilizumab
- Prolong ICU stay patient
- Truma, Burn & IV drug abuses
- Voriconazole therapy
- Contaminated apparatus

**Symptoms of Mucormycosis [12, 13]**

Symptoms of Mucormycosis	Symptoms
<b>Rhinocerebral (sinus and brain) mucormycosis</b>	One-sided facial swelling Headache Nasal or sinus congestion Black lesions on nasal bridge or upper inside of mouth that quickly become more severe Fever

<b>Pulmonary (lung) mucormycosis</b>	Fever Cough Chest pain Shortness of breath
<b>Cutaneous (skin) mucormycosis</b>	blisters or ulcers, and the infected area may turn black. Other symptoms include pain, warmth, excessive redness, or swelling around a wound.
<b>Gastrointestinal mucormycosis</b>	Abdominal pain Nausea and vomiting Gastrointestinal bleeding

**Diagnosis**

<b>Lab investigation</b>	CBC, ESR, FBS, HbA1, RFT, crusting discoloured mucosa, scabbing
<b>Imaging</b>	CECT of PNS & Nose, CE MRI brain/Orbit/Face
<b>Microscopy</b>	KOH staining
<b>Histopathology</b>	culture

**Treatment [14]**

<b>Medication</b>	<b>Surgery</b>
Antifungal medicine, usually amphotericin B, posaconazole, or isavuconazole.	Cut away the infected tissue

**CONCLUSION**

Mucormycosis is unusual, but it’s more frequent among people who have health problems or take medicines that lower the body’s ability to fight germs and sickness. Although protect yourself from the environment and antifungal medication is preventive measures of the black fungus. Decline the immunity of patients after COVID-19 infection, so mucormycosis cases are also increasing due to inhalation of molds containing industrial oxygen. The main rationale of the present article is to provide a comprehensive review on mucormycosis, its epidemiology, diagnosis, treatment, and its association with COVID-19.

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