



**A SHORT REVIEW ON MUCORMYCOSIS (BLACK FUNGUS)**

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**ABSTRACT**

The mucormycosis, belongs to the order Mucorales, caused by fungi. In India the term black fungus has been widely applied to pathogenic Mucorales. It is mainly infecting the sinuses, lungs, brain, intestine and the skin. Black fungus is a serious fungal infection. Also known as black fungus and sometimes called zygomycosis. It is an invasive filamentous fungal infection characterized by a rapid invasion of blood vessels and neighbouring structures. Black fungus (mucormycosis) mainly affects people who have health problems or who are taking antiretroviral drugs. Human immunity is low after covid-19 patients are at high risk of contracting the infection.

**KEYWORDS:** Types, Pathogenesis, Mechanism, Etiology, Symptoms, Relation with COVID-19, Treatment.

**INTRODUCTION**

Mucormycosis also known as black fungus is a serious fungal infection, usually in people with reduced ability to fight infections.<sup>[1,2,3,4]</sup> It is a serious but rare disease caused by a group of fungi called mucormycetes. These fungi live in all ecosystems, especially in soil and decaying materials, such as leaves, piles of manure, or decaying wood. Mucormycosis is an invasive filamentous fungal infection characterized by a rapid invasion of blood vessels and neighboring structures. The morbidity and mortality due to mucormycosis remain high throughout the world.<sup>[1]</sup> Individuals who have diabetes, chronic renal failure, iron overload, neutropenia, hematological malignancies, and induced immunosuppression or immunodeficient conditions are particularly vulnerable to mucormycosis.<sup>[5]</sup>

People get mucormycosis by contact with natural fungal bacteria. For example, a lung infection or sin can occur after a person inhales the virus. These types of mucormycosis often occur in people with health problems or who are taking antiretroviral drugs.<sup>[6,7]</sup> Mucormycosis can also develop on the skin after the fungus enters the skin through cuts, burns, or other forms of skin irritation.

**Types of mucormycosis**

1. Rhinocerebral (sinus and brain) mucormycosis is an infection of the sinuses that can spread to the brain. This form of mucormycosis is more common in humans I had a kidney transplant.<sup>[8,9]</sup>
2. Pulmonary (lung) mucormycosis is the most common type of mucormycosis in people with

cancer and in people with implants or stem cell transplants.

3. Intestinal mucormycosis is more common in children younger than adults, especially infants with a low birth weight and less than one month old, who have received antibiotics, surgery, or antidepressants.<sup>[10,11]</sup>
4. Skin (skin) of cut mucormycosis: occurs after the fungus enters the body through a break in the skin (for example, after surgery, burns, or other type of skin irritation). This is the most common form of mucormycosis among people who do not have a weakened immune system.
5. The spread of mucormycosis occurs when the infection spreads to the bloodstream to affect another part of the body. Infection often affects the brain, but can also affect other organs such as the spleen, heart, and skin.

**Types of fungi that often cause mucormycosis**

Examples are: Rhizopus species, Mucor species, Rhizomucor species, Syncephalastrum species, Cunninghamella bertholletiae species, Apophysomyces species, and Lichtheimia species (formerly Absidia).<sup>[12]</sup>

**Pathogenesis-**Agents Ordinary fungus Mucorales (phase zygomycetes) is the cause of mucormycosis, a life-threatening fungal infection affecting unprotected agents (implants, diabetic patients, leukopenic, acidotic patients and patients on chelation of iron-containing deferoxamine) in their developing or developed countries. (The species of family Mucoraceae is often distinguished from patients with mucormycosis. Among Mucoraceae, Rhizopus oryzae (Rhizopus arrhizus) is the

most common cause of infection. Increased cases of mucormycosis have also been reported due to spun infection.

The skin represents a major barrier to the fungus that causes mucormycosis. Agents of mucormycosis are often unable to penetrate incomplete skin. However, burns, painful disturbances of the skin or the addition of soil and contaminated water, and persistent skin tightening cause the body to penetrate deep tissue and cause infection. In addition, contaminated wear and non-adhesive adhesive tape have been shown to be a major source of primary mucormycosis. Ingestion is a means of transmitting intestinal mucormycosis. Inhalation of mucorales sporangiospores by unresponsive patients leads to the development of pulmonary mucormycosis and diffuse distribution.

### Mechanism

Most people are exposed to Mucorales without contracting the disease.<sup>[16]</sup> Mucormycosis is usually spread by inhalation, by eating contaminated food, or by acquiring Mucorales seeds from an open wound. Not transmitted between persons.

The exact mechanism of diabetes is not known. In vivo, high sugar alone does not allow the growth of the fungus, but acidosis alone is conducive. People with high blood sugar often have high levels of iron, and are known to be at risk for developing mucormycosis. In people with deferoxamine, the extracted metal is taken up by siderophores in *Rhizopus* species, which use iron to grow.

### Etiology

Mucormycetes are a type of fungus that causes fungal infections. These molds can be found everywhere in nature, including soil, air and food. They enter the body through the nose, mouth, or eyes and can affect the brain if left untreated. According to medical experts, the main cause of black fungus (mucormycosis) is steroid abuse during COVID treatment.

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### Symptoms

The symptoms of mucormycosis depend on where in the body the fungus is growing in our body.<sup>[21]</sup>

Contact your healthcare provider if you have symptoms that you think are related to mucormycosis. They may include:

- Fever
- Cough
- Chest pain
- Shortness of breath
- Swelling on one side of your face
- Headache
- Sinus congestion
- Belly pain
- Nausea and vomiting
- Gastrointestinal bleeding
- Blood in your stool
- Diarrhoea

### Relation with COVID-19

Mucormycosis is a Angio invasive disease caused by a fungal order of Mucorales such as *Rhizopus*, *Mucor*, *Rhizomucor*, *Cunninghamella* and *Absidia*. The prevalence of mucormycosis in India is about 0.14 cases per 1000 people, about 80 times the increase in developed countries.<sup>[16]</sup> COVID-19 infection is associated with fungal infections. Mucormycosis is most commonly seen in immunocompromised individuals, and problems with orbital and cerebral involvement may occur in diabetic ketoacidosis and in combination with the use of steroids. The most common risk factor associated with mucormycosis is diabetes in India.<sup>[17]</sup> after COVID-19 infection, only a limited number of cases of mucormycosis were reported, but no known first reported cases of sudden loss of COVID-19 infection occurred in a newly diagnosed diabetic.

### Treatment

Treatment includes a combination of antifungal, surgical removal of infectious tissue and fixing sub-medical complications such as diabetes ketoacidosis.<sup>[19]</sup>

### MEDICATIONS

As soon as mucormycosis is suspected, Amphotericin B at an initial dose of 1mg is first given for a minimum of 10-15 minutes in a vein, and then given as a daily dose for weight loss for the next 14 days.<sup>[22]</sup> It may need to be continued for a long time. Isavuconazole and Posaconazole alternatives.<sup>[23]</sup>

### Surgery

Surgery can be very difficult, and in some cases of diseases involving the nasal cavity and the brain, it may be necessary to remove infected brain tissue. Removal of the palate, nasal cavity, or eye makeup may be severely impaired. Sometimes more than one need is needed.<sup>[16]</sup>

### Other considerations

The disease should be carefully monitored for any signs of reincarnation.<sup>[23,24]</sup> Treatment also requires adjusting blood sugar levels and improving neutrophil counting. Hyperbaric oxygen can be considered as a combination therapy, because high oxygen concentrations increase the ability of neutrophil-killing neutrophils. The validity of this information is uncertain.<sup>[25]</sup>

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