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BLACK FUNGS THE DISEASE STORMING THE NEW WORLD

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ABSTRACT

Mucormycosis, also known as black fungus, is a virulent and invasive fungal infection caused by fungi in the Mucorales order.[1] Rhizopus oryzae is the most common organism isolated from mucormycosis, a group of moulds known as mucoromycete.[2] It can affect a variety of organs, but it is currently manifesting as an invasive rhino-orbito-cerebral disease that affects the ear, nose, throat, and mouth. It is not contagious, but it can cause significant internal damage and can be fatal if not detected early. The disease's common name, "black fungus," refers to the disease's characteristic blackening.

KEYWORDS: Black Fungus, Diabetes Mellitus, Ketoacidosis, HIV/AIDS.

INTRODUCTION

Mucormycosis is an extremely uncommon infection. Exposure to mucor mould, which is commonly found in soil, plants, manure, and decaying fruits and vegetables, causes it. It is common and can be found in the soil, the air, and even the water nose and it affects the sinuses, the brain and the lungs and can be life-threatening in diabetic or severely immunocompromised individuals, such as cancer patients or people with HIV/AIDS.

Uncontrolled diabetes mellitus in ketoacidosis, other forms of metabolic acidosis, corticosteroid treatment, organ or bone marrow transplantation, neutropenia, trauma and burns, malignant hematologic disorders, and deferoxamine therapy in haemodialysis patients are major risk factors for mucormycosis.[3, 4, 5] Because of the growing prevalence of diabetes, cancer, and organ transplantation, the number of patients at risk of contracting this lethal infection is rapidly increasing.[6] Despite disfiguring surgical debridement and adjunct antifungal therapy, the overall mortality rate for mucormycosis is still greater than 50%, and it approaches 100% in patients with disseminated disease or persistent neutropenia.[3, 7] New

strategies for preventing and treating mucormycosis are clearly needed, and such strategies can be aided by a clear understanding of the disease's pathogenesis.

The number of patients at risk for this deadly infection is growing as the prevalence of diabetes mellitus, cancer, and organ transplantation rises. Despite aggressive treatment, such as disfiguring surgical debridement and frequently adjunctive toxic antifungal therapy, the overall mortality rate is high. New approaches to preventing and treating mucormycosis are desperately needed. Understanding mucormycosis pathogenesis and the host response to invading hyphae.

Current state of knowledge about the virulence traits used by Rhizopus oryzae, the most common etiologic agent of mucormycosis. Because patients with elevated serum levels of available iron are uniquely susceptible to mucormycosis, and these infections are highly Angio invasive, the organism’s ability to acquire iron from the host, as well as its interactions with endothelial cells lining blood vessels, is emphasised. Several promising preclinical therapeutic strategies have been identified.

Doctors believe mucormycosis, which has an overall mortality rate of 50%, may be being triggered by the use of steroids, a life-saving treatment for severe and critically ill Covid-19 patients.

Steroids appear to help prevent some of the damage that can occur when the body’s immune system goes into overdrive to fight off coronavirus by reducing inflammation in the lungs for Covid-19. They do, however, lower immunity and raise blood sugar levels in both diabetic and non-diabetic Covid-19 patients. It is thought that this decrease in immunity is what is causing these cases of mucormycosis.

Expertise and a member of India’s Covid-19 Task Force, stated that several parts of the country were reporting an increase in Covid-Associated Mucormycosis (CAM), which he attributed to the “irrational use of steroids” in Covid treatment. Five days later, the Health Ministry declared the infection — colloquially known as “black fungus” — notifiable, requiring states to report suspected and confirmed cases.

Union Minister for Chemicals and Fertilizers, stated on May 22 that India had 8,848 cases of mucormycosis. Almost half of the cases were in Gujarat (2,281) and Maharashtra (2,000), which had added another 245 cases in other states.

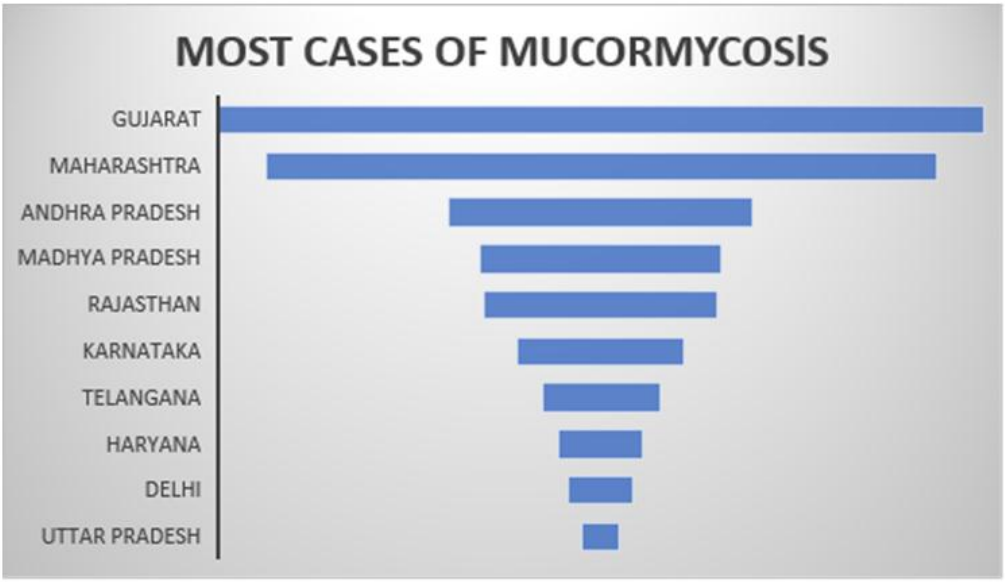

Figure 1: Data of mucormycosis in India.

Along with discussions about COVID-19, the black fungal infection has piqued people's interest. It is a rare type of fungal infection that affects 1 in 10,000 people but has a 50% mortality rate. It is also known as "black fungus" or "mucormycosis." The disease is often characterised by hyphae growing in and around blood vessels, and it can be potentially fatal in diabetic or severely immunocompromised people.

Mucormycosis frequently infects the sinuses, brain, or lungs. While infection of the oral cavity or the brain is the most common form of mucormycosis, the fungus can also infect other organs.

HOST DEFENCE AGAINST MUCORMYCOSIS

Individuals who lack phagocytes or have impaired phagocytic function are clearly at a higher risk of mucormycosis, according to clinical and experimental data. Patients who are severely neutropenic, for example, are at a higher risk of developing mucormycosis. Patients with AIDS, on the other hand, do not appear to be at increased risk of developing mucormycosis.[4] These findings suggest that neutrophils, but not necessarily T lymphocytes, play an important role in inhibiting fungal spore proliferation. Furthermore, normal host mononuclear and polymorphonuclear phagocytes kill Mucorales by producing oxidative metabolites and cationic peptides, defensins.[8–9] A recent study found that neutrophils exposed to R. Oryzae hyphae have increased Toll-like receptor 2 expression as well as robust proinflammatory gene expression with rapid induction of NF-B pathway–related genes.[10] Phagocytes are dysfunctional in the presence of hyperglycaemia and low pH, which is found in diabetic

ketoacidosis (DKA) patients, with impaired chemotaxis and defective intracellular killing by both oxidative and nonoxidative mechanisms.[11]

In accordance with these clinical findings, inhaling Mucorales sporangiospores by immunocompetent animals does not result in mucormycosis.[8] Corticosteroid-immunocompromised or DKA animals, on the other hand, die of progressive pulmonary and hematogenously disseminated infection.[8,12] Furthermore, the ability of inhaled sporangiospores to germinate and form hyphae in the host is critical for infection establishment. Although pulmonary alveolar macrophages isolated from the lungs of immunocompetent mice can ingest and inhibit the germination of R. Oryzae sporangiospores, their ability to kill the organism in vitro is limited.[9] In contrast, pulmonary alveolar macrophages from immunocompromised mice are unable to prevent sporangiospore germination in vitro or after intranasal infection.[8]

The precise mechanisms by which ketoacidosis, diabetes, and corticosteroids impair phagocytes remain unknown. Furthermore, phagocyte dysfunction alone cannot account for the high incidence of mucormycosis among DKA patients, because the incidence of mucormycosis among these patients is higher than the incidence of infections caused by other pathogens.[3, 4, 13] As a result, Mucorales must have distinct virulence characteristics that allow the organism to take advantage of the organism's unique immunosuppressive state.

Black Fungus in Covid-19

The number of patients reporting this disease in the hospital is higher than those who suffered from corona about 10-15 days ago. Several cases have been registered for this black fungal infection, which attaches inside the ear, nose and throat. Out of which in few cases, the patient had to lose one eye and few patients died. In which most of the patients are suffering from diabetes. It has been about 14 days since these patients emerged from the corona, immediately after they have been caught by this infection.

Presentation of two types of mucormycosis have been commonly observed with Covid-19 patients, whether active, recovering or post discharge. this include Rhino-Orbito-Cerebral Mucormycosis (ROCM) and Pulmonary mucormycosis.

SIGNS AND SYMPTOMS

Warning signs include pain and redness around the eyes or nose, with fever headache, coughing, shortness of breath, bloody vomits, and altered menta status. according to the advisory, infection with mucoromycetes should be suspected when.

- Black fungus symptoms show some common symptoms, including excessive runny nose
- Patient may feel swelling and pain in their eyes, when they come in contact with the infection.
- Dark spots can also be seen around the nose of the infected patient.
- Some patients have also spoken about their eyesight being completely gone.
- Sinusitis- nasal blockade or congestion, nasal discharge(blackish/bloody).
- Local pain on the cheek bone, one- sided facial pain, numbness or swelling.
- Blackish discolouration over bridge of nose/palate.
- Loosening of teeth, jaw involvement.
- Blurred or double vision with pain.
- Thrombosis, necrosis, skin lesion.
- Chest pain, pleural effusion, worsening of respiratory symptoms.

Doctors say that patients come to the hospital late considering these symptoms as normal. Due to the spread of eye infraction, the eyes of some patients also had to be removed by surgery because the infection could spread to the brain through the eye.

In some cases, both the eyes of the patient had to be removed and the jaws of some of the more infected patients also had to be removed through operation. It is mainly seen in black fungal infection post covid patients.

CAUSES

Due to non-judicious use of drugs for lung infection like fluconazole or voriconazole which hamper the body's immunity against fungus. This infection had also been confirmed in the mucus of a healthy person.

Generally, the patients who are prone to black fungus infection are those who have recently got rid of the corona virus. This infection is seen more in the patient with cancer or HIV/AIDS patients.

PREVENTION

In black fungal disease preventing person need to get sugar level checked on time and try to keep it limited. Patients recovering from corona should be tested in time to keep their sugar right. To prevent this infection doctor should give injections of steroids to the patients on time.

Experts recommend to give the correct dose of steroids as soon as the patient are free from corona infection. Wear masks, long sleeve shirt while handling soil, moss or during gardening.

TREATMENT

This can be prevented if given black fungus infection treatment drugs in time. Antifungals intravenous injection is said to be effective in preventing this disease. In some cases, it can require surgery, it can lead to eventual loss of the upper jaw and sometimes even an eye.

It is of utmost important to control diabetes, reduce steroid use, and discontinue immunomodulating drugs. To maintain adequate systemic hydration, the treatment includes infusion of normal saline (IV) before infusion of amphotericin B and antifungal therapy for at least 4-6 weeks.

Experts have stressed the need to control hyperglycaemia, and monitor blood glucose level after discharge following COVID-19 treatment, and also in diabetics, one should use steroids judiciously-correct timing, correct dose and duration are important.

Dos and Don'ts

People have been advised to control hyperglycaemia, keep a tab on blood glucose level after COVID-19 discharge and in diabetics, to use clean, sterile water for humidifiers during oxygen therapy, judicious use of steroids, antibiotics/antifungal.

Treating mucormycosis requires a multidisciplinary approach. It is expected to put an additional burden on the country's healthcare infrastructure, which is already under a strain due to the second wave of COVID-19.

CONCLUSION

It is a preview compilation based on the studies available so far, further analysis being done will be reported in future. Awareness and early diagnosis can help curb the spread of the

fungal infection. Usually, mucoromycetes does not pose a major threat to those with a healthy immune system. It mainly affects people who have health problems or take medicines that lower the body's ability to fight germs and sickness.

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