

Probable reasons for More Post Covid Mucormycosis Infections observed in Bharat/India

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Mucormycosis, is also known as black fungus as in culture it shows black hyphae/black colonies. This is one of very serious fungal infection, usually seen in people with immunosuppression. Symptoms depend on the site or location of this infection in the body. These infections are most commonly seen in the nose, sinuses, eye and brain resulting in a runny nose, even one sided facial swelling and pain, headache, fever, blurred vision, swollen and bulging of eye, and tissue death. Other forms of disease may infect the lungs, stomach and intestines, and skin. Most commonly it spread by spores of molds of the order Mucorales, most often through inhalation, contaminated food, or contamination of open wounds. These fungi are present commonly in soils, decomposing organic matter (such as rotting fruit and vegetables), and animal manure, but usually do not affect people. One of its most important character is that it is not transmitted between people. Most important predisposing factors are diabetes with persistently high blood sugar levels or diabetic ketoacidosis, low white cells, cancer cells, cancer, organ transplant, iron overload, kidney problems, long-term steroids or immunosuppressant use, and to a lesser extent in HIV/AIDS

Laboratory diagnosis is commonly carried out by biopsy, KOH preparation & culture, with medical imaging to help determine the extent of disease. Some time it may appear similar to aspergillosis. Treatment of choice is generally with amphotericin B and surgical debridement. Preventive measures include wearing a face mask in dusty areas, avoiding contact with water-damaged buildings, and

protecting the skin from exposure to soil such as when gardening or certain outdoor work.

Mucormycosis tends to progress rapidly and is fatal in about half of sinus cases and almost all cases of the widespread type. Mucormycosis is usually very rare, affecting fewer than two people per million people each year in San Francisco, but is now ~80 times more common in India. People of any age may be affected, including premature infants the first known case of mucormycosis was possibly one described by Friedrich Küchenmeister in 1855. The disease has been reported in natural disasters; 2004 Indian Ocean tsunami and the 2011 Missouri tornado. During the COVID-19 pandemic 2020/21, an association between mucormycosis and COVID-19 has been reported. This association is thought to relate to reduced immune function during the course of the illness and may also be related to glucocorticoid therapy for COVID-19. A considerable rise in cases was particularly noted in India.

Mucormycosis is a fungal infection caused by fungi in the order Mucorales. In most cases it is due to an invasion of the genera *Rhizopus* and *Mucor*; common bread molds. Most fatal infections are caused by *Rhizopus oryzae*. It is less likely due to *Lichtheimia*, and rarely due to *Apophysomyces*. Others include *Cunninghamella*, *Mortierella*, and *Saksena*.

The fungal spores are in the environment, can be found on for instance moldy bread and fruit and are breathed in frequently, but cause disease only in some people. In addition to being breathed in

to be deposited in the nose, sinuses and lungs, the spores can also enter the skin via blood or directly through a cut or open wound, or grow in the intestine if eaten. Once deposited, the fungus grows branch-like filaments which invade blood vessels, causing clots to form and surrounding tissues to die. Other reported causes include contaminated wound dressings. Mucormycosis has been reported following the use of elastoplast and the use of tongue depressors for holding in place intravenous catheters.

Outbreaks have also been linked to hospital bed sheets, negative-pressure rooms, water leaks, poor ventilation, contaminated medical equipment especially contaminated humidifier bottle of patients on oxygen and building. Works. Other reason might be humid and hot weather, dusty air and unhygienic habits

Similarly, during COVID-19, patients prescribed heavy and prolonged steroid doses can have weakened immune systems. "We've seen people go crazy with steroid prescriptions," says Lance-lot Pinto, a pulmonologist at Mumbai's P.D. Hinduja Hospital and Medical Research Center. "There's a misperception among doctors that more severe the [COVID-19] case, higher the dose of steroids needed, which isn't supported by any trial so far." Steroids can cause blood sugar levels to spike, which can be especially challenging for patients with uncontrolled diabetes. Higher blood sugar levels and more acidic blood creates a fertile environment for Mucorales fungi to thrive.

In such vulnerable patients, the spores germinate to form long tubular filaments that can grow into the sinuses, into the bone, and the blood stream. The symptoms of mucormycosis and progression of the infection can vary from person to person; they include a throbbing headache, fever, facial and nasal pain, blackish nasal discharge, loss of vision, toothache, loosening of teeth, swelling in the upper jaw, and sometimes face paralysis.

"This is a horrific infection, and can be disfiguring," Hohl says. "Unless treated, the infection can cross into the central nervous system, and that's more dangerous." The chances of dying exceeds 50 percent if the infection reaches the brain.

Early diagnosis can be lifesaving. But the infections can be extremely challenging to treat, even at an early stage. Patients are prescribed antifungal treatments such as liposomal amphotericin B injections for at least 10 days to several weeks after diagnosis. But these essential drugs have the potential to induce substantial side-effects, including kidney damage.

Often, a surgical intervention is also needed. In less severe cases doctors insert an endoscope through the nasal cavity and remove any diseased tissue. If the infection has spread further, the surgeons may need to remove the eyes or the jaw bone

A number of cases of mucormycosis, aspergillosis, and candidiasis, linked to immunosuppressive treatment for COVID-19 were reported during the COVID-19 pandemic in India in 2020 and 2021. One review in early 2021 relating to the association of mucormycosis and COVID-19 reported eight cases of mucormycosis; three from the U.S., two from India, and one case each from Brazil, Italy, and the UK. The most common underlying medical condition was diabetes. Most had been in hospital with severe breathing problems due to COVID-19, had recovered, and developed mucormycosis 10-14 days following treatment for COVID-19. Five had abnormal kidney function tests, three involved the sinus, eye and brain, three the lungs, one the gastrointestinal tract, and in one the disease was widespread. In two of the seven deaths, the diagnosis of mucormycosis was made at postmortem. That three had no traditional risk factors led the authors to question the use of steroids and immunosuppressive drugs. Although, there were cases without diabetes or use of immunosuppressive drugs. There were cases reported even in children. In May 2021, the BBC reported increased cases in India. In a review of COVID-19-related eye problems, mucormycosis affecting the eyes was reported to occur up to several weeks following recovery from COVID-19.

The mucormycosis ther countries affected included Pakistan, Nepal, Bangladesh, Russia, Uruguay, Paraguay, Chile, Egypt, Iran, Brazil, Iraq, Mexico, Honduras, Argentina and Oman. One explanation for why the association has surfaced remarkably in India is high rates of COVID-19 infection and high rates of diabetes. For now, though, these unexpected infections have brought new challenges for patients who are already physically, emotionally, and financially depleted from a recent COVID-19 infection.

The surging demand for antifungal medication has created an acute shortage, giving rise to a back market for drugs that were already too expensive for most people to afford. In an overwhelmed health-care system, finding hospitals where mucormycosis patients can get surgery and post-operative care can be another logistical nightmare.

While India's mucormycosis cases surface in only a small fraction of the country's total COVID-19 case numbers, the uptick is concerning. To prevent such infections in the first place, public health experts stress that hospitals maintain hygiene, especially for equipment that dispenses oxygen, especially humidifier bottle. Someone had even suggested that the humidifier bottle should be filled with methylene blue, which is fungicidal, in spite of water; they advise that doctors prescribe steroids judiciously and suggest regular monitoring of blood sugar levels for all COVID-19 patients in the hospital and at home, even in the post-recovery period.

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