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The Rising Havoc of the Black, White and Yellow Fungi in India

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Abstract

The diseases caused by fungus are common in the plant kingdom, but in humans and animals, fungal infection is not familiar due to the protective shield provided by the immune system of humans and animals. However, in the scenario where the immune system is weakened by the infection of the deadly Coronavirus, the harmless fungi group takes an opportunity to attack the human body, which can be life-threatening. The fungal pathogen invades the human body through wounds or via the respiratory tract. Therefore, when it enters the body tissue, it eats it up for energy and withstands the immune shield. Currently, the world is dealing with the novel Coronavirus, now the profound attack of another group of microscopic enemy called black, white and yellow fungus infection has created havoc amidst the insuperable pandemic.

Introduction

Fungi are separate organism from plants and animal kingdom. These are eukaryotic microorganisms that belong to different heterotypic groups. Some fungi are unicellular like yeast, and some are multicellular like mucor. They are also classified into different groups depending on their morphology, nutrition and habitat. Some fungi are helpful as saprophytes and decomposers, while some are infectious. Generally, fungi are omnipresent which play an essential role in the degrading and decomposition of organic matter. Fungi reproduce mainly by asexual mode of reproduction like fragmentation, binary fission, and budding or by spores. Some fungi cause disease in healthy people, but most fungal infections occur in immune-compromised individuals.

However, some fungi are pathogenic, including *Aspergillus*, *Candida* and *mucormycosis* (Borjian *et al.*, 2021). Despite the fact that fungi are so common in our environment, yet they do not create a menace to human health due to the presence of defence action by our immunity system. Therefore, when the strength of the immune system trembles due to several underlying causes, the fungi infiltrate and ambush.

Most Vulnerable Group for Infection

The drugs used for cancer treatment or to prevent rejection of an organ transplant or the steroids used in the treatment of Covid-19 disease tremble the body's immune system. Moreover, the patients staying in an intensive care unit for an extended period can develop a weakened immune system. So the people with a weak immune system due to diabetes, hypertension, cancer chemotherapy, steroid medicines, blood diseases, and immuno-suppressant medication in the organ transplant recipient, AIDS patient and malnourished person are the most endangered group to the

fungi. The Covid-19 patients are at high risk since Covid-19 damages the airway mucosa and blood vessels. In addition to that, the antibiotics administered to patients kill infectious bacteria and destroy beneficial microorganisms, leading to the wipeout of good microflora in the body. The prolonged use

of ventilators reduces the immunity-boosting capacity in the body. Moreover, the transmission of fungus can be through the water used in the humidifier along with oxygen, and this moist condition creates a favourable microclimate for the growth of fungi and causes many fungal diseases (Table 1).

Table 1: A Comparison of Black, White and Yellow Fungus

Particulars	Black fungus	White fungus	Yellow fungus
Causal organism	Mucor fungus	Candida fungus	Mucor fungus
Disease development	It occurs when the immune-compromised patient comes in contact with the mucor fungus, which spreads to the eyes, nose, lungs and skull cavity. Though non-contagious, it can be deadly if not treated on time.	The white fungus begins from the tongue or private parts, it makes the patchy tongue white, and then it spreads to other parts like the lungs, brain and food pipes.	The yellow fungus starts internally, causes pus leakage, and leads to slow healing of wounds. In severe cases, it could further lead to organ failure and serious necrosis.
Organs affected	Lungs, respiratory, digestive tract	Face, nose, eye orbit, skull tissue	Internal organs
Who are at risk	Immune-compromised patients, unhygienic environment, prolonged use of steroids, cancer patients.	Diabetes, Covid patients, persons taking steroids, extended stay in ICU ventilators.	Poor hygiene, contaminated resources or overuse of steroids, antibacterial medications or poor oxygen use.
Symptoms	Fever, headache, blurred vision, blackening of tissue on reddish and swollen skin near the cheeks and nose, facial pain, cough producing bloody or dark fluids, and shortness of breath.	Cough, breathing trouble, white discharge, white patches in the oral cavity, chest pain.	Lethargy, poor appetite, sunken eyes.
Treatment	Removal of infected tissue by surgery, liposomal amphotericin B injections, other antifungal drug posaconazole.	Fluconazole, caspofungin, micafungin	Amphotericin B injection

Black Fungus (Mucormycosis)

Black fungus is called mucormycosis, which is caused by mucor. It enters the body through respiration or skin wounds. When any person respire, the immune system fights back the fungus and destroys it. Whereas, in immunosuppressed patients, the fungus dominates the immune system and starts attacking the body tissues. The filamentous hyphae grow on body tissue, releasing some chemical that eats up the tissue and becomes a food source for the fungus. They generally attack the jawbones, nasal bones, orbital bones and skull bones. If it is detected earlier when the infection is limited to the nasal cavity, the person will have a fair chance of survival. However, when it starts attacking the skull tissues in later stages, it can cause haemorrhages and death. Though it is not contagious, but it is a serious concern.

Symptoms of Black Fungus

- Pain in the eyes.
- Severe headache.

- Discolouration or blackening of tissue on nose and cheeks.
- Congestion in the nose.
- Loss or blurred vision.
- Toothache.
- Swelling in eyes or cheeks.
- Bleeding from the nose.

Treatment of Black Fungus

After detection of the fungus by MRI or CT scan, depending on the severity of infection, treatment is prescribed. If the tissues are infected, immediate surgical procedures to remove that particular tissue must be carried out. When it attacks the eye socket or upper jaw, patients end up in losing the part. Intracranial decompression may be required if the infection has spread to the brain. The patients are prescribed antifungal drugs, namely injection Liposomal amphotericin-B. Isavuconazole is also an alternative drug that can be used. The antibiotics and steroids

administered during Covid-19 treatment should be judiciously used. Patients, during or post Covid-19 recovery, should be given utmost care in hygiene (www.indianexpress.com) As many as 20 vials of this injection are required to treat each infected person, with each vial costing between Rs. 5,000.00 and Rs. 6,000.00.

White Fungus (Candidiasis)

White Fungus infection is caused by a candida group of fungus and also called candidiasis. It can be due to unhygienic condition, overuse of steroidal medication or unsterile oxygen cylinders in hospitals. It is a more severe condition than black fungus as it attacks the lungs and leads to respiratory illness. In addition, it produces white patches on the oral cavity and discharges white pus. It attacks the skin, kidney, mouth and brain. Fungal infection in the lungs and tracts of respiration and in blood, the condition can be life-threatening.

Symptoms of White Fungus

- Whitish patches in the oral cavity.
- White discharge.
- Skin lesions.
- Symptoms of pneumonia of cough, chest pain and low oxygen level.

Treatment of White Fungus

To treat mild infection of white fungus, antifungal drugs like fluconazole or itraconazole can be used orally. Topical applications will be required for infections in the oral cavity or urinary areas. Serious infections in critically ill patients are treated with caspofungin or micafungin. Additionally, it can be avoided by proper sanitization in ICU ventilators and oxygen cylinders. Proper care should be taken for weak patients while treating them by sanitizing the medical instruments.

Yellow Fungus

After the reports of dangerous black and white fungus keeping the lives of people in jeopardy, few days back, a new fungus was detected first in the Ghaziabad region. The yellow fungus can be more fatal than that of black and white fungus as the symptoms are visible because it starts its initial symptoms in internal organs. This makes the detection at a very later stage. Like the other fungi, it is also caused by unhygienic condition and immunodeficiency in the body (www.timesofindia.indiatimes.com).

Symptoms of Yellow Fungus

- Lethargy.
- Loss of appetite.
- Loss in weight.
- Redness and sunken eyes.
- Delay in the healing of the wound.

- In serious cases, the yellow fungus can also cause leakage of pus and slow healing of the open wound and slow healing of all wounds, malnutrition and organ failure and sunken eyes due to eventual necrosis.

Treatment of Yellow Fungus

The only treatment for Yellow Fungus is Amphotericin B injection, which is a broad-spectrum antifungal medicine.

Precautions to Avoid Fungal Infections

- The hygienic environment around the vulnerable patients.
- Sterile use of medical equipment like ventilators.
- Avoid excess humidity in an isolation area.
- Cleaning of daily use clothes and bedsheets.
- Judicious use of immune-suppressants.
- The use of sanitized masks always.
- Covid-19 patients are high risk, so they need to follow proper care.
- Report to doctor immediately in any initial symptoms.

Conclusion

When the world is still in its second wave of deadly pandemic of Covid-19, the pathogenic fungi has created wide scale chaos in some areas of the country and has been declared as epidemic in few states. As it attacks the ones with weak immune system, the persons from Covid-19 recovery, patients with immunosuppressant, diabetics etc. are at high risk of infection. Even if drugs are available for its cure, it is highly life threatening. In this global pandemic, even a small epidemic should be avoided by taking extra precautions by vulnerable groups.

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