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Editorial

Opportunistic fungal infections and Covid-19: Colored or pigmented fungi?

Dhiraj B. Nikumbh ^{1,*}

¹Dept. of Pathology, SBH, Government Medical College, Dhule, Maharashtra, India



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Dear Researchers,

Opportunistic fungal infections in Covid-19 lead to prolong morbidity and mortality in affected patients. The Coronavirus pandemics especially in the second wave was tough and challenging time due to rapid and alarming number of cases of these opportunistic fungal infections among recovered Covid patients as well as new Covid cases.¹

Colored fungi lead to unending woes presenting the extra stress on already exhausted healthcare system. They are the colored fungal infections due to various reasons and the pigmented fungal infections in Covid is a misnomer.¹ India registered 11,700 cases of mucormycosis till May 25, 2021.² In India, the states like Maharashtra, West Bengal, Tamil Nadu, Telangana and Rajasthan declared as a notifiable disease under the Epidemic Disease Act, 1987.¹ It was rampant too in other countries like India.¹ Though fungal infections are not new or unique to Covid, these primarily occurs in compromised immunity patients or peoples taking long time drugs for diabetes mellitus, cancer, chemotherapy patients, HIV, or hospitalized ICU patients taking steroids and antibiotics for prolong period.^{1,2} Latest theories leads to role of prolong O₂ use and iron overload.^{1,2}

Fungi are present everywhere and are tiny organisms like moulds or mildew. They are present everywhere in air, water or on human body.¹ Out of them 50% are harmful. If one

of the harmful fungi leads on your skin, cause a fungal infection. Susceptibility of fungal infections increased in immunocompromised patients, patients with excess iron/taking desferoxamine, trauma, burns or malnutrition people.¹

Regarding terminologies, like 'black fungus', 'white fungus', 'yellow fungus', 'green fungus' can be misleading and misnomer with additional factor of creation of panic amongst common peoples. All these fungi are grouped together and called as mucormycosis for easy understanding.¹ However, the black fungus targets brain and eyes mainly, white fungi targets lungs and yellow one targets the both brain/eyes and lungs as per researchers.^{2,3}

'Black fungus' commonly referred to mucormycosis. These fungal infection commonly infect the nose, face, orbit of the eyes, brain and lungs. It is the fungal infection by mucorales strains like Rhizopus, Mucor and Absidia.¹ Mucor is black fungus and a misnomer. Black fungus is often called as Dematiaceous fungi or pigmented fungi are completely different family. Mucor doesn't belong to black fungus family.³ It is so called black fungi because of its tissue necrosis. The blackening of tissue is what gives it the name. It causes invasion of tissues and blood vessels and thus interrupts blood supply to normal tissue, which gets then necroses and changes colour to black.⁴ Any necrosed decomposed tissue produces eschar and that is colored black. So, technically, Mucor is not a black fungus, but causes the tissue affected to necrose and turn into black.^{3,4}

* Corresponding author.

E-mail address: drdhirajnikumbh@gmail.com (D. B. Nikumbh).

'White fungus' is caused by and seen commonly in yeast called candida albicans.³ It produces white or creamy white spots on plates of agar and in humans, it gives white spots on mucosa of oral cavity, GIT and skin as well. They are commensals in the oral cavity and gastrointestinal tract and are present on skin as well. Candida albicans is the most commonly isolated species.⁴ Albicans means white so these are called as white fungus.^{3,4}

'Yellow fungus' is a term coined by anonymous and unfortunately doesn't have any relevance.⁴ Yellow fungus is seen in patients with production of yellow colored pus as seen most commonly in bacterial infection. Yellow fungus does not have any significance. Superadded on that fungal growth of variety of species of fungal infection.⁴ It does not mean that fungi are causing the color in this category. Yellow is the color of pus, which is formed whenever there is any bacterial infection. Superadded on that, there may be fungal growth of a wide variety of species. It does not mean that the fungal infection is causing the color. It doesn't mean that there is a "new yellow fungus which is more dangerous than black and white fungus".⁴

'Green fungus' is an infection caused by aspergillus, which is a common mould. People can get infected by aspergillosis by breathing of microscopic spores of aspergilla's from the environment.¹ There may soon be a "Green fungus" or "Multicoloured fungus" variant reports coming in from different parts of the country. These all are misnomer and confuse the common man, henceforth the awareness and proper understanding is of prime important in this regard because of novel nature of Covid 19 and its opportunistic ones.

The Indian Council of Medical Research (ICMR) has laid out advisory guidelines for the management of mucormycosis during the time of COVID-19⁵ as follows.

1. Patients need to control diabetes and diabetic ketoacidosis and immunomodulating drugs should be discontinued
2. Antifungal prophylaxis is not needed.
3. Necrotic materials should be removed through extensive surgery.
4. Amphotericin B should be infused after infusing Normal saline as IV.
5. Antifungal therapy needs to be carried out for 4-6 weeks.
6. Patients should be constantly monitored and the disease progression should be checked through radio-imaging technique.

The ICMR has also put guidelines on how to prevent getting a fungal infection during COVID-19.

1. People should avoid crowded places and maintain social distancing.

2. All should wear masks and wash their hands properly.
3. Keep your surroundings clean and take a regular bath.
4. People working at a construction site should have a proper face mask.
5. Avoid eating too much sugar in diet and control diabetes.

Early diagnosis of fungal infection by clinical suspicious, direct microscopic examination/microbiology, histopathology, culture and PCR based assay to ensure proper and effective line of treatment. The aim of this editorial is to highlight the opportunistic fungal infections in the Covid 19 and the dilemma on colored or pigmented fungi.

To summarize, accurate, prompt and proper diagnosis of fungi by clinical, microbiological and pathological examination is of paramount important rather the color of fungi for betterment of patient and to avoid mortality and mortality of Covid 19 new and recovered patients.

Conflict of Interest

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Author biography

Dhiraj B. Nikumbh, Associate Professor (SBH, Government Medical College, Dhule, Maharashtra, India)  <https://orcid.org/0000-0002-7440-9007>

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