







Drug resistant White fungus: another catastrophic fungus emergence amidst COVID-19 in India

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As the world continues to battle the COVID-19 pandemic, India was struck by the second wave of this disease during the past few months. There was a rapid spread of the SARS-CoV-2 virus across the country to the point that the daily number of cases were above 200,000 in the third week of April [1]. This crisis has claimed 280,683 lives while infecting more than 25 million people so far. The various mutants of the virus, especially the B.1.617 variant might have intensified this wave [2]. The massive number of cases (31,026,829 confirmed cases as of 16 July 2021) in India have overloaded its healthcare capacity resulting in a shortage of beds, ventilators, drugs and oxygen [2,3].

Furthermore, India has been facing an outbreak of Mucormycosis, or ‘black fungus’, which is associated with SARS-CoV-2 infection. The inappropriate use of steroids and broad-spectrum antibiotics for the management of COVID-19 are plausible causes for this association [4]. Other causes could be prevalent immunosuppression due to widespread diabetes, using unclean nebulizers, prolonged intubation and oxygen support. Moreover, one of the major causes is steroid use, in doses more than required. On 31 March 2020, the Directorate General of Health Services (DGHS) suggested a Methylprednisolone dosage of 1–2 mg per kilo of a patient’s bodyweight per day for severe COVID-19 patients (between 70–140 kg per day) while in the US, NIH have suggested a maximum of 32 mg/day [5].

While Mucormycosis cases proliferated, a new menace called ‘white fungus’ surfaced [6]. Cases of infections caused by the *Candida* species, namely *Candida auris* and *Candida albicans*, have recently been reported in some Indian states such as Bihar, Delhi, West Bengal and Uttar Pradesh. Among the two fungi, *Candida auris* is known to cause serious multidrug-resistant nosocomial infections. Although there is no evidence of person-to-person transmission, the main routes of contracting the infection are via inhalation of spores and indwelling

catheters. Deprived immunity and prolonged hospitalization, especially in the ICU, promote the contraction of this infection. Improper cleaning of oxygen supply systems promotes fungal spore contamination and later, inhalation by the patient. Reports show that 20–30% of severely ill and mechanically ventilated patients are at risk of contracting this infection [7].

The spread of *Candida* infections in the bloodstream causes systemic infection, affecting organs like kidneys, intestines, genitals and skin. A study in Delhi showed that candidemia affected nearly 2.5% of COVID-19 patients in the ICU [8]. *Candida auris* was responsible for at least two-thirds of candidemia cases in COVID-19 patients and among those, the fatality rate was 60%. Moreover, all cases of *Candida auris* were resistant to Fluconazole and nearly 40% were resistant to Amphotericin B [9]. Serious repercussions include multi-organ dysfunction, and the basic symptomatology coincides with that of COVID-19 infection including fever, cough and shortness of breath. Hence, careful observation and vigilance is required to avoid dangerous sequelae [6,9].

These cases of fungal infections require, yet to be imposed, strict guidelines from the healthcare sector and the government, which citizens must follow. Namely, the imprudent use of steroids and antibiotic drugs by the patients must be discouraged. Hospitals’ management should advise their support staff to clean the oxygen supply systems regularly. Moreover, there should be regular audits/quality improvement projects which aim to improve drug administration, diagnostic measures and the overall quality of patient care. Since both COVID-19 and ‘white fungus’ infections share some of their mild symptoms, vigilance and efficient diagnostic capabilities are vital. As per reports, patients are prone to develop the fungal infection at around

7–10 days of hospitalization, and that's when careful observation and intervention is required [4,6]. Secondly, antifungal drugs should be made readily available in adequate amounts by the government in case there is a massive outbreak of this infection.

While the country has not yet recovered from the second wave of COVID-19, the recent threats of opportunistic fungal infections may lead to an unprecedented burden on the country's healthcare system. Hence, the invaluable lessons learnt from the second wave must be put into action immediately. Preparedness, prevention and prudence are the mainstays of controlling these outbreaks.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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