

LETTER TO THE EDITOR

Mucormycosis or black fungus infection is a new scare in South Asian countries during the COVID-19 pandemic: Associated risk factors and preventive measures

Dear Editor,

A life-threatening fungal infection has upsurged that further exacerbates the dire situation of the COVID-19 pandemic in India and nearby South Asian countries. The fungal infection more commonly being referred to as mucormycosis or black fungus infection due to its blackening effect on the skin, is on the rise among patients affected with or recovering from COVID-19. The fungus does not spread from contact with infected humans or animals.¹ India has already reported the highest prevalence of mucormycosis in the world. As of June 28, 2021, India has reported 40,845 cases of black fungus, with the highest reported cases in Gujarat and Maharashtra. Also, the country reported 3,129 related deaths till June 28, 2021.² This abrupt rise in cases has been attributed to the deadly second wave of the coronavirus outbreak in India as most of the victims seem to be patients recovering from COVID-19. This sudden increase in black fungus infection might have a connection with the ongoing COVID-19 pandemic. A neighboring country, Bangladesh, should be particularly vigilant, as they have also reported their first two cases of "black fungus," as well as one suspected death.³ Dissemination of mucormycosis occurs extraordinarily fast in the human body, and a delay of even a few hours could prove fatal.⁴ In this communication article, we focus on the risk factors associated with mucormycosis in COVID or post-COVID patients.

COVID-19 patients generally suffer from a decreased level of lymphocytes, particularly helper T-cells and cytotoxic T-cells. These cells play a vital role in the inflammation-mediated immune response of the body, and their reduced level makes COVID-19 patients extremely vulnerable to secondary bacterial and fungal infections. In addition, doctors administer immunosuppressing steroidal drugs to COVID-19 patients that can further debilitate their immunity. However, the steroidal drugs reduce the phagocytic activity of neutrophils and macrophages in COVID-19 patients. Also, steroidal drugs cause a sudden increase in blood sugar levels in diabetic patients that is another vital risk factor for developing mucormycosis. Moreover, an iron-rich environment is favorable for this fungal infection. Increased cytokine levels such as interleukin-6 increase the ferritin level of COVID-19 patients, making them even more vulnerable to mucormycosis infection. Also, unsanitized oxygen cylinders and ventilators might be responsible for this fungal outbreak. During the second wave, some hospitals were using ventilators on a shared basis. Some of the oxygen cylinders being used were contaminated and this unhygienic condition could have contributed to this sudden rise of mucormycosis cases. Indian doctors

had also previously warned about the use of cow dung and urine to boost immunity against COVID-19.⁵ This is because animal dung might have different fungi. Therefore, COVID-19 patients with diabetes mellitus and who had been prescribed immunosuppressant corticosteroid drugs for their treatment are most vulnerable to mucormycosis infection.⁶ Also, several unhygienic practices could have contributed to this sudden upsurge of mucormycosis as well.

In some cases, when the fungal infections spread to the eyes, doctors suggest removal of eyes to halt the spread of the virus to the brain which leads to lethality. More than 80% of the patients need surgery immediately. According to the Centers for Disease Control and Prevention (CDC) of the United States, the mortality rate of mucormycosis is 54%, which may vary based on the affected body part and health condition of patients.⁷ The early detection and starting of treatment are critical for this fungal infection because either the patients do not go to physicians at the early stage or doctors often are unsuccessful in identifying this. The lengthy and expensive treatment regimen makes it more challenging for the public health authorities. The disease burden of "black fungus" amidst this ongoing coronavirus pandemic has created several negative consequences on the public healthcare systems of South Asian countries.


Therefore, management strategies involve early diagnosis of the disease, keeping diabetes mellitus and other associated risk factors in check, treating patients with intravenous antifungal products such as amphotericin B, and surgical intervention if necessary.⁸ Patients who are suffering from or have just recovered from COVID-19 should not expose themselves to any of these natural habitats of the fungus.⁹ Hospitals should ramp up their hygiene, particularly for oxygen cylinders, ventilators, and breathing pumps. The authorities should monitor for rational use of steroids to prevent cytokine storms in COVID-19 patients. Finally, we hope that the seriousness of this issue will be recognized by the policy-makers and prompt action will be taken and resources allocated to ward off this potentially devastating epidemic.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Fahad I. Rahman and Md. Rabiul Islam conceived the study, wrote the initial draft, edited and revised the manuscript. Mohiuddin A. Bhuiyan provided data, wrote the initial draft of the manuscript. All the authors reviewed and approved the final submission.

Fahad I. Rahman¹
Md. Rabiul Islam² 
Mohiuddin A. Bhuiyan²

¹Department of Clinical Pharmacy and Pharmacology,
University of Dhaka, Dhaka, Bangladesh

²Department of Pharmacy,
University of Asia Pacific, Dhaka, Bangladesh

Correspondence

Md. Rabiul Islam, Department of Pharmacy, University of Asia
Pacific, 74/A Green Rd, Farmgate, Dhaka 1205, Bangladesh.
Email: robi.ayaan@gmail.com

ORCID

Md. Rabiul Islam  <https://orcid.org/0000-0003-2820-3144>

REFERENCES

1. Daria S, Asaduzzaman M, Shahriar M, Islam MR. The massive attack of COVID-19 in India is a big concern for Bangladesh: the key focus should be given on the interconnection between the countries. *Int J Health Plann Manage*. 2021. <https://doi.org/10.1002/hpm.3245>
2. Mint. India reports 40,854 cases of black fungus so far. Mint, 2021. <https://www.livemint.com/news/india-records-over-40k-cases-of-mucormycosis-11624875874985.html>. Accessed July 15, 2021.
3. Moral S. Person dies of black fungus, suspect BIRDEM physicians. *Prothom Alo*. <https://en.prothomalo.com/bangladesh/bangladesh-reports-first-death-in-black-fungus>. Accessed May 26, 2021.
4. Sugar AM. Mucormycosis. *Clin Infect Dis*. 1992;14:S126-S129. https://doi.org/10.1093/clinids/14.Supplement_1.S126
5. Daria S, Islam MR. The use of cow dung and urine to cure COVID-19 in India: a public health concern. *Int J Health Plann Manage*. 2021:e3257. <https://doi.org/10.1002/hpm.3257>
6. Moona AA, Islam MR. Mucormycosis or black fungus is a new fright in India during covid-19 pandemic: Associated risk factors and actionable items. *Public Health Pract (Oxf)*. 2021;2:100153. <https://doi.org/10.1016/j.puhip.2021.100153>
7. Centers for Disease Control and Prevention. Mucormycosis statistics. <https://www.cdc.gov/fungal/diseases/mucormycosis/statistics.html>. Accessed May 26, 2021.
8. Barnagarwala T, Ahsan S. Explained: shortage of black fungus drug. *The Indian Express*. <https://indianexpress.com/article/explained/shortage-of-black-fungus-drug-cases-india-7330327/>. Accessed May 26, 2021.
9. Spellberg B, Edwards J, Ibrahim A. Novel perspectives on mucormycosis: pathophysiology, presentation, and management. *Clin Microbiol Rev*. 2005;18(3):556-569. <https://doi.org/10.1128/CMR.18.3.556-569.2005>