

Mucormycosis, conflicts and COVID-19: A deadly recipe for the fragile health system of Afghanistan

Afghanistan, a country with fragile healthcare infrastructure, was hit hard by the outrageous spread of the COVID-19 pandemic. When the virus reached the borders, it was apparent that the country would suffer to a great extent, especially with regards to the healthcare sector. In the aftermath of the pandemic, the healthcare system became more vulnerable.¹ In particular, in low- and middle-income countries, the failure of research and scientific groups to predict the COVID-19 epidemic, give attention to short-term preventive measures, and impediments of word politics in formulating ideal solution, have resulted in unparalleled public health crises in recent times.^{2,3} Afghanistan with its comparatively lower number of healthcare workers, as well as beds have been vehemently stressed by the pandemic.⁴ Adding to the woes, are several incidents of violence and conflict which continue to take place in Afghanistan during these troubled times, posing serious challenges in the measures undertaken to contain the spread of COVID-19.⁴

The country has recently entered into the third wave of the pandemic. The third wave has been unprecedented so far, leading to a grave situation due to lack of oxygen supply and availability of hospital beds. Moreover, sluggish rates of vaccination have also been observed in the country.⁵ All these situations have led to an increase in the number of cases. As of 15 July 2021, the country has reported 139,051 cases, of whom 6072 died, and 86,219 have recovered.⁶ However, these numbers may not be an accurate indicator of the true burden of the disease because of low testing capacity.

Currently, Afghanistan's healthcare system is dwindled by a surge in cases of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the emergence of mucormycosis, a deadly fungal disease will most definitely overwhelm the country's ability to cope amidst all the other challenges. To date, more than 10 cases of black fungus have been reported in the country.⁷ However, this is not the first time a disease has surged amidst the pandemic, earlier Afghanistan also had witnessed a spike in the number of cases of Polio.⁸ As of now, Black fungus has emerged in other countries like Pakistan, Egypt, Iraq as well as Chile.⁹ For countries like Afghanistan, such a deadly fungus would cause significant distress.

Mucormycosis is an angioinvasive infection caused by mold fungi from the genus *Rhizopus*, *Mucor*, *Rhizomucor*, *Cunninghamella*, and *Absidia* of the Order Mucorales, Class Zygomycetes.¹⁰ It was first reported during the pandemic in India amidst the brutal second wave. Majority of patients recovering from COVID-19 are either in an immune dis-regulated state as a result of SARS-CoV-2 infection or are immuno-suppressed due to the use of corticosteroids in moderate and severe disease. As, steroids are known to cause immune suppression, it has therefore been implicated and identified to increase the susceptibility to mucormycosis. Other factors could include repetitive usage of home-made masks with higher moisture, the use of contaminated nebulizers, and frequent and longer intubation linked to the severity of COVID-19. This illustrates a syndemic nature of the co-infection.¹¹ Many other co-infections have also shown the same trend with COVID-19 such as Dengue fever, Lassa fever, Yellow fever, Measles, and Zika.¹²⁻¹⁷

Mucormycosis is characterized by necrosis of host tissues caused by hyphae invasion of the vasculature with a time course of less than four weeks.¹⁸ The mode of transmission includes inhalation of spores into a susceptible host's paranasal sinuses. Almost 90 percent of the COVID associated mucormycosis cases involved the nose and sinuses, and the overall mortality was found to be 31 percent.¹⁹ Due to the rapidly progressive nature of this disease, prompt diagnosis and treatment is vital to manage these patients. In most cases, regardless of timely intervention from both medical and surgical specialties, the prognosis is poor.²⁰ Many risk factors play a role in predisposing patients to the infection, that is diabetes mellitus, pulmonary diseases, immunosuppressive therapy, malignancies, malnutrition,

and others. Impaired cell-mediated immunity with decreased CD4+T- and CD8+T-helper cell counts and overexpression of inflammatory cytokines occurs in patients with COVID-19 infection, indicating predisposition to fungal co-infections.²¹

Mucormycosis is an arduous disease to diagnose thus making it difficult to treat due its delay in early management. Although rare, its effects can be extremely detrimental in terms of prognosis especially with an added infection such as COVID-19. The diagnosis relies heavily on histopathology, and therefore tissue samples should be taken and investigated for non-septate hyphae that branch at right angles.²² Once diagnosed or even suspected, it's essential to conduct imaging investigations to document the extent of disease.²³ The mainstay treatment is Amphotericin B and adjunct surgical debridement of any necrosed tissue. Also, India being the country with one of the highest numbers of COVID associated-mucormycosis cases, has suffered from severe drug shortages and Afghanistan too may be headed in the same direction, as they previously struggled with drug shortages in the early days of the pandemic.²⁴⁻²⁶ The protracted conflict in the country has also played an important role in adversely impacting the healthcare resources and services amidst the pandemic as health workers and health facilities have been routinely subjected to acts of violence.⁴

It is also pertinent to note that the spread of mucormycosis could be curtailed with appropriate measures being taken by the government as well as other stakeholders at the earliest. The Afghan government along with the ministry of health must issue guidelines or an advisory on effective screening, diagnosis as well as management of COVID-19 associated mucormycosis along with precautionary methods to be followed. Steps taken by policymakers to pass stricter laws to regulate the dispensing of drugs as well its prescription and usage will most definitely help reduce the unnecessary and uncontrolled use of drugs such as steroids, which causes immunosuppression and is a known risk factor for mucormycosis infection. Wounds inflicted in battle as a result of wars which continues to plague Afghanistan, have already been known to be associated with invasive fungal infections.²⁷ Therefore, the military officials also need to take into consideration the possibility of a further increase in mucormycosis cases among the military as well as para-military personnel, and to take steps to hopefully reduce conflict especially during the pandemic. Instituting special task forces as well as setting up of a national registry or database to document relevant information in all patients with mucormycosis across the country would help in monitoring as well as mapping of the disease. Actions taken to mobilize as well as arrange for drugs, isolated wards and other medical facilities in maximum number of health centers will help to effectively manage a potential increase in mucormycosis cases. The recommendations discussed above would help prevent further rise in mortality due to COVID-19 associated mucormycosis and possibly help mitigate an impending crisis.

KEYWORDS

Afghanistan, conflicts, COVID-19, mucormycosis

ACKNOWLEDGMENTS

Not applicable. No funding from any institution or department.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

ETHICS STATEMENT

The present study includes printed and published information; therefore, the formal ethical clearance was not applicable for this study.

AUTHOR CONTRIBUTIONS

All authors have substantially contributed in this research.

Mohammad Yasir Essar¹ 

Hiba Khan²

Maryam Salma Babar² 

Mohammad Mehedi Hasan^{3,4} 

Sudhan Rackimuthu⁵

Ana Carla dos Santos Costa⁶

Shoaib Ahmad⁷

Arash Nemat¹

¹Kabul University of Medical Sciences, Kabul, Afghanistan

²Dubai Medical College, Dubai, United Arab Emirates

³Department of Biochemistry and Molecular Biology, Faculty of Life Science, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh

⁴Division of Infectious Diseases, The Red-Green Research Centre, BICCB, Dhaka, Bangladesh

⁵Father Muller Medical College, Mangalore, Karnataka, India

⁶Faculty of Medicine, Federal University of Bahia, Salvador, Bahia, Brazil

⁷Punjab Medical College, Faisalabad, Pakistan

Correspondence

Mohammad Yasir Essar, Kabul University of Medical Sciences, Kabul 1001, Afghanistan.

Email: yasir.essar@gmail.com

ORCID

Mohammad Yasir Essar  <https://orcid.org/0000-0002-6554-7619>

Maryam Salma Babar  <https://orcid.org/0000-0003-2777-2521>

Mohammad Mehedi Hasan  <https://orcid.org/0000-0002-3871-889X>

REFERENCES

1. Nemat A, Asady A, Raufi N, et al. A survey of the healthcare workers in Afghanistan during the COVID-19 pandemic. *Am J Trop Med Hyg.* 2021;104(2):537-539. <https://doi.org/10.4269/AJTMH.20-1367>
2. Correia T. SARS-CoV-2 pandemics: the lack of critical reflection addressing short- and long-term challenges. *Int J Health Plann Manag.* 2020;35(3):669-672. <https://doi.org/10.1002/HPM.2977>
3. Correia T. The precariousness of political management of the SARS-CoV-2 pandemic in the search for scientific answers: calling for prudence in public health emergencies. *Int J Health Plann Manag.* 2021. <https://doi.org/10.1002/HPM.3253>
4. Lucero-Prisno DE, Essar MY, Ahmadi A, Lin X, Adebisi YA. Conflict and COVID-19: a double burden for Afghanistan's healthcare system. *Conflict Health.* 2020;14(1):1-3. <https://doi.org/10.1186/S13031-020-00312-X>
5. Essar MY, Wara U-U, Mohan A, et al. Challenges of COVID-19 Vaccination in Afghanistan: a rising concern. *Ethics, Med Public Heal.* 2021:100703. <https://doi.org/10.1016/J.JEMEP.2021.100703>
6. Worldometer. Afghanistan COVID: 139,051 cases and 6,072 deaths. 2021. Accessed July 16, 2021. <https://www.worldometers.info/coronavirus/country/afghanistan/>
7. TOLONews. 10 Black fungus cases reported in Afghanistan. 2021. Accessed July 16, 2021. <https://tolonews.com/afghanistan-173360>
8. Ahmadi A, Essar MY, Lin X, Adebisi YA, Lucero-Prisno DE, III. Polio in Afghanistan: the current situation amid COVID-19. *Am J Trop Med Hyg.* 2020;103(4):1367-1369. <https://doi.org/10.4269/AJTMH.20-1010>
9. Dangerous Indian black fungus spreads to 4 more countries. 2021. Accessed July 14, 2021. <https://www.aa.com.tr/en/asia-pacific/dangerous-indian-black-fungus-spreads-to-4-more-countries/2264124>
10. Eucker J, Sezer O, Graf B, Possinger K. Mucormycoses. *Mycoses.* 2001;44(7-8):253-260. <https://doi.org/10.1111/J.1439-0507.2001.00656.X>
11. Rocha ICN, Hasan MM, Goyal S, et al. COVID-19 and mucormycosis syndemic: double health threat to a collapsing healthcare system in India. *Trop Med Int Heal.* 2021. <https://doi.org/10.1111/TMI.13641>

12. Yousaf A, Khan FMA, Hasan MM, Ullah I, Bardhan M. Dengue, Measles, and COVID-19: a threefold challenge to public health security in Pakistan. *Ethics, Med Public Heal*. 2021;100704. <https://doi.org/10.1016/J.JEMEP.2021.100704>
13. Mohan A, Temitope RA, Çavdaroğlu S, et al. Measles returns to the Democratic Republic of Congo: a new predicament amid the COVID-19 crisis. *J Med Virol*. 2021. <https://doi.org/10.1002/JMV.27137>
14. Costa AcdS, Hasan MM, Xenophontos E, et al. COVID-19 and Zika: an emerging dilemma for Brazil. *J Med Virol*. 2021;93(7):4124-4126. <https://doi.org/10.1002/JMV.27006>
15. Hasan MM, Costa AcdS, Xenophontos E, et al. Lassa fever and COVID-19 in Africa: a double crisis on the fragile health system. *J Med Virol*. 2021;27169. <https://doi.org/10.1002/JMV.27169>
16. Çavdaroğlu S, Hasan MM, Mohan A, et al. The spread of Yellow fever amidst the COVID-19 pandemic in Africa and the ongoing efforts to mitigate it. *J Med Virol*. 2021;93(9):5223-5225. <https://doi.org/10.1002/JMV.27027>
17. Uwishema O, Adanur I, Babatunde AO, et al. Viral infections amidst COVID-19 in Africa: implications and recommendations. *J Med Virol*. 2021;27211. <https://doi.org/10.1002/JMV.27211>
18. Ferguson BJ. Definitions of fungal rhinosinusitis. *Otolaryngol Clin North Am*. 2000;33(2):227-235. [https://doi.org/10.1016/s0030-6665\(00\)80002-x](https://doi.org/10.1016/s0030-6665(00)80002-x)
19. Singh AK, Singh R, Joshi SR, Misra A. Mucormycosis in COVID-19: a systematic review of cases reported worldwide and in India. *Diabetes Metab Syndr Clin Res Rev*. 2021;15(4):102146. <https://doi.org/10.1016/J.DSX.2021.05.019>
20. Ballester DG, González-García R, García CM, Ruiz-Laza L, Gil FM. Mucormycosis of the head and neck: report of five cases with different presentations. *J Craniomaxillofac Surg*. 2012;40(7):584-591. <https://doi.org/10.1016/j.jcms.2011.10.015>
21. Song G, Liang G, Liu W. Fungal co-infections associated with global COVID-19 pandemic: a clinical and diagnostic perspective from China. *Mycopathologia*. 2020;185(4):599-606. <https://doi.org/10.1007/s11046-020-00462-9>
22. Reid G, Lynch JP, Fishbein MC, Clark NM. Mucormycosis. *Semin Respir Crit Care Med*. 2020;41(01):099-114. <https://doi.org/10.1055/s-0039-3401992>
23. Cornely OA, Alastruey-Izquierdo A, Arenz D, et al. Global guideline for the diagnosis and management of mucormycosis: an initiative of the European confederation of medical mycology in cooperation with the mycoses study group education and research consortium. *Lancet Infect Dis*. 2019;19(12):e405-e421. [https://doi.org/10.1016/s1473-3099\(19\)30312-3](https://doi.org/10.1016/s1473-3099(19)30312-3)
24. Roien R, Essar MY, Ahmadi A, et al. Challenges of drug supply: how Afghanistan is struggling. *Public Heal Pract*. 2021;2:100129. <https://doi.org/10.1016/J.PUHHP.2021.100129>
25. Ghosh S, Moledina N, Hasan MM, Jain S, Ghosh A. Colossal challenges to healthcare workers combating the second wave of coronavirus disease 2019 (COVID-19) in India. *Infect Control Hosp Epidemiol*. 2021;1-2. <https://doi.org/10.1017/ICE.2021.257>
26. Reuters. India faces antifungal drug shortage as rare complication adds to COVID-19 woes. Accessed July 14, 2021. <https://www.reuters.com/world/india/india-reports-259551-new-coronavirus-infections-2021-05-21/>
27. Tribble DR, Rodriguez CJ. Combat-related invasive fungal wound infections. *Curr Fungal Infect Rep*. 2014;8(4):277. <https://doi.org/10.1007/S12281-014-0205-Y>