

MUCORMYCOSIS IN COVID POSITIVE PATIENTS - A MICROBIOLOGICAL ANALYSIS

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Abstract

Background: During the COVID-19 pandemic, an increase in mucormycosis fungal infection created panic among people in India. Mucormycosis is an opportunistic, invasive and life-threatening fungal infection. The present study aims to perform a microbiological analysis of mucormycosis in COVID-19 patients. **Materials and Methods:** A prospective study of 20 Covid-19-positive patients clinically diagnosed as mucormycosis was done at a Tertiary care hospital from May 2021 to August 2021. Tissue samples from suspected mucormycosis individuals were collected in two containers for direct KOH examination and fungal culture inoculation. Microscopic examinations identified broad, aseptate, ribbon-like hyphae. The tissue samples were inoculated in Sabouraud Dextrose agar and incubated for growth. Fungal isolates were identified using lactophenol cotton blue mount and slide culture.

Results: Among 20 patients, 12 patients' cultures were positive. The KOH examination and fungal culture were positive in 10 cases. Further, the KOH examination was negative in two patients, but the fungal culture was positive. In eight patients, both KOH examination and fungal culture were found negative. Of 12 positive culture isolates, Rhizopus species were predominantly identified in 10 cases and mucor species in two cases. **Conclusion:** Identification of mucormycosis by clinicians in COVID-19 patients and recovered patients are highly desirable. Mucormycosis is possibly curable if diagnosed early. Thus, a high index of suspicion is needed while treating COVID-19 patients.

INTRODUCTION

The pandemic of the coronavirus disease 2019 (COVID-19) has affected the health sector globally. It is caused by a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Several reports suggest its association with multiple opportunistic bacterial and fungal infections. Many cases of mucormycosis in COVID-19-affected individuals have been increasingly reported worldwide, particularly in India. The coexistence of COVID-19 infection with high blood sugar levels and immunosuppressive treatments, in conjunction with other risk factors (prolonged hospitalization with or without mechanical ventilators), could contribute to increased incidence of Mucormycosis. The patient's immunity and general health are two major factors associated with Mucor infection. Mucormycosis is a severe angioinvasive fungal infection caused by many nonseptate filamentous

fungal species classified under Mucorales.^[1] The order Mucorales includes several species involved in rhinocerebral, pulmonary, cutaneous, and gastrointestinal infections, all characterized by a tendency to disseminate. Mucormycosis can be communicated by inhalation or direct spores inoculation on the disrupted skin or mucosa. Irrespective of the infection route, the blood vessels are invaded by hyphae, leading to tissue infarction and necrosis.^[2] The most common members of Mucormycetes in human infection are the genera Rhizopus, Mucor, Lichtheimia, Rhizomucor, and Apophysomyces. Rhizopus species are reported to be the regularly isolated agents from mucormycosis patients.^[3]

Common risk factors are prolonged neutropenia, corticosteroid usage, diabetic and metabolic acidosis, human immunodeficiency virus (HIV) infection, and advancing age. Rhinocerebral mucormycosis is the most common clinical presentation and is strongly associated with poorly

handled diabetes mellitus.^[4] In the pre-COVID era, the incidence of mucormycosis is very low in the general population, ranging from 0.005 to 1.7 per million.^[5] In the 2003 SARS-CoV infection outbreak, fungal infection was 14.8-27%, a key factor for the death of severe acute respiratory syndrome patients. Thus, suggesting an increased prevalence of fungal infection in SARS-CoV-affected and recovered patients. The study aims to do microbiological analysis of mucormycosis in COVID-19 patients.

MATERIALS AND METHODS

We conducted a prospective study of 20 Covid-19-positive patients clinically diagnosed as mucormycosis from May 2021 to August 2021. The descriptive study was conducted at a Tertiary care hospital.

The non-COVID-19 patients or the individuals with nonconsent were excluded.

Tissue samples from clinically suspected mucormycosis individuals were collected in two sterile containers. One sample container was used for direct KOH examination, and the other was used for fungal culture inoculation. For diagnosis, direct

presentation of fungal elements in the clinical sample is essential to establish.

The microscopic examinations of specimens in KOH (10% & 40% potassium hydroxide) wet mount were performed to identify characteristic broad, sparsely septate, and ribbon-like hyphae (wide-angle or right-angle branching at irregular intervals).

The tissue sample was inoculated in two tubes with Sabouraud Dextrose Agar (SDA) followed by incubation at 37°C and 22°C. Cultures were monitored for growth daily in the first week. The fungal isolates were identified by lactophenol cotton blue mount and slide culture.

RESULTS

A total of 20 Covid positive patients who were clinically diagnosed with mucormycosis were studied. This includes ten female and ten male patients, and all patients' mean age was 56 years.

Out of 20 patients, culture was positive in 12 patients. Among the culture-positive cases, both KOH examination and fungal culture became positive in 10 cases. The KOH examination was negative in two patients, but the fungal culture was positive. In eight patients, both KOH examination and fungal culture were found negative.

KOH & Culture- Result	Number
KOH and culture positive	10
KOH negative and culture positive	2
KOH and culture negative	8

Of 12 culture isolates, Rhizopus species were identified in ten cases, and mucor species were identified in two.

DISCUSSION

The first report of mucormycosis as a causative human disease was documented in 1885. [6] Over the last few decades, a dramatic rise in the prevalence of invasive fungal infections has been noted globally. This could be a result of risk population size increase. It is categorized as an acute necrotizing fungal infection with a fulminant course due to angioinvasion and is also termed as 'black fungus' in India. Mucormycetes include 20 pathogenic fungal species categorized into 12 genera. Mucormycosis has been commonly associated with Rhizopus genus.^[7] Mucormycosis is rarely diagnosed in healthy individuals but is commonly seen in immunocompromised conditions (uncontrolled DM, haematological and other malignancies, prolonged neutropenia, organ transplantation, corticosteroid, and immunosuppressive therapy.^[8] The mode of mucormycosis infection is reported by inhaling, ingesting or direct inoculation through wounds and germinating into angioinvasive hyphae within the humans.^[9,10] Diabetes mellitus, combined with the SARS-CoV-2 virus and steroid therapy, seems to be the deliberate cause of hyperglycemia and immunosuppression, leading to mucormycosis.

In the present study, Rhizopus species were identified in ten cases. Mucor species were identified in two cases. Therefore, the current study highlights the need for more awareness about the disease, its early diagnostics measures, and management.

CONCLUSION

The awareness of mucormycosis by clinicians in COVID-19 patients and patients recovered from COVID-19 (with inappropriate steroid therapy and with uncontrolled diabetes mellitus) is highly essential. Mucormycosis is potentially treatable in case of early diagnosis. Thus, a high index of suspicion should be there while treating COVID-19 patients.

REFERENCES

- Mudgal, S., Rao, S., & Pai, M. O. (2022). Mucormycosis: A comparative update between conventional and molecular diagnosis strategies. *Current medical mycology*, 8(1), 44–53.
- Greenberg RN, Scott LJ, Vaughn HH, Ribes JA. Zygomycosis (mucormycosis): emerging clinical importance and new treatments. *Curr Opin Infect Dis* 2004;17:517–25.
- Ribes JA, Vanover-Sams CL, Baker DJ. Zygomycetes in human disease. *Clin Microbiol Rev* 2000;13:236–301.

4. Bala K, Chander J, Handa U, Punia RS, Attri AK. A prospective study of mucormycosis in north India: experience from a tertiary care hospital. *Med Mycol* 2015;53:248–57.
5. Werthman-Ehrenreich A. Mucormycosis with orbital compartment syndrome in a patient with COVID-19. *Am J Emerg Med* 2021;42:264.e5-264.e8.
6. Paltauf A. Mycosis mucorina: Ein Beitrag zur Kenntniss der menschlichen Fadenpilzkrankungen. *Virchows Arch* 1885;102:543–64.
7. Gomes MZR, Lewis RE, Kontoyiannis DP. Mucormycosis caused by unusual mucormycetes, non-Rhizopus, -Mucor, and -Lichtheimia species. *Clin Microbiol Rev* 2011;24:411–45.
8. Sugar AM. Mucormycosis. *Clin Infect Dis* 1992;14 Suppl 1:S126-9.
9. Ahmadikia K, Hashemi SJ, Khodavaisy S, Getso MI, Alijani N, Badali H, et al. The double-edged sword of systemic corticosteroid therapy in viral pneumonia: A case report and comparative review of influenza-associated mucormycosis versus COVID-19 associated mucormycosis. *Mycoses* 2021;64:798–808.
10. Gupta A, Sharma A, Chakrabarti A. The emergence of post-COVID-19 mucormycosis in India: Can we prevent it? *Indian J Ophthalmol* 2021;69:1645–7.