

Case Report

# COVID-19-Associated Rhino-Orbital Mucormycosis with Diabetic Ketoacidosis in a Patient with Recurrent SARS-CoV-2 Positivity: A Case Report

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## I N F O

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## A B S T R A C T

The COVID-19 pandemic led to an unprecedented rise in opportunistic fungal infections, particularly mucormycosis, in patients with uncontrolled diabetes. We present a case of a 52-year-old woman with Type 2 diabetes mellitus and hypothyroidism who developed rhino-orbital mucormycosis during a suspected re-infection with SARS-CoV-2, along with diabetic ketoacidosis. The case highlights the syndemic interaction between COVID-19 and chronic metabolic diseases and emphasises the need for early recognition of red flag symptoms. Early diagnosis, antifungal therapy, and multidisciplinary management were crucial in achieving a favourable outcome.

**Keywords:** Rhino-Orbital Mucormycosis, Covid-19, Diabetes Mellitus, Diabetic Ketoacidosis, Reinfection, Opportunistic Fungal Infection

## Introduction

Mucormycosis is a rare, aggressive angio-invasive fungal infection caused by Mucorales fungi such as *Rhizopus*, *Mucor*, and *Lichtheimia* species. It typically affects immunocompromised individuals, particularly those with uncontrolled diabetes, haematological malignancies, or who are undergoing corticosteroid therapy.<sup>1</sup> Rhino-orbital-cerebral mucormycosis (ROCM) represents the most common presentation in diabetics and can progress

rapidly to involve the orbit and brain, with a high fatality rate if not promptly diagnosed and treated.<sup>2</sup>

During the second wave of the COVID-19 pandemic in India, there was an alarming rise in cases of mucormycosis, colloquially termed the “black fungus epidemic.”<sup>3</sup> Several hypotheses have been proposed to explain this surge, including immunosuppression due to the virus itself, widespread steroid use, and pre-existing uncontrolled diabetes.<sup>4,5</sup> Reinfection with SARS-CoV-2, although less

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common, can present with atypical features and pose diagnostic challenges, especially when overlapping with other critical conditions such as mucormycosis.<sup>6</sup>

We report a case of rhino-orbital mucormycosis in a middle-aged woman with known Type 2 diabetes mellitus and hypothyroidism, who presented during the second wave of the COVID-19 pandemic in India, with facial pain, periorbital swelling, and diabetic ketoacidosis and suspected COVID-19 reinfection.

### Case Presentation

A 52-year-old woman, a housewife from a lower socioeconomic background, presented to our tertiary care centre with complaints of right-sided facial pain and swelling for two weeks, right periorbital oedema for four days, high-grade fever for two days, and purulent nasal discharge with diminished vision in the right eye for one day. There was no history of headache, diplopia, tinnitus, or respiratory symptoms.

Her medical history was significant for type 2 diabetes mellitus for eight years, hypothyroidism for ten years, and dyslipidaemia for three years. She had a documented COVID-19 infection four months prior to the current admission, managed conservatively without oxygen or ICU support. She denied recent steroid use. There was a strong family history of diabetes mellitus.

On general examination, the patient was conscious, oriented, and febrile (temperature 100°F) with pallor and signs of poor nutritional status. Pulse was 110/min, blood pressure 140/80 mmHg, and respiratory rate 28/min with rapid breathing. There was right-sided facial erythema, periorbital oedema, and ulceration of the hard palate with purulent discharge.

Neurological examination revealed intact higher mental functions and cranial nerves. Pupillary reflexes were preserved, extraocular movements were full, and vision was grossly intact (able to count fingers). There were no signs of meningeal irritation or cerebellar dysfunction, but peripheral neuropathy of the lower limbs was noted. Abdominal, cardiovascular, and respiratory examinations were unremarkable.

Her blood sugars were elevated, and arterial blood gas analysis showed high anion gap metabolic acidosis with urine acetone positivity suggestive of diabetic ketoacidosis. COVID-19 testing using both rapid antigen and RT-PCR was positive at admission, raising the suspicion of re-infection. A summary of the baseline laboratory and radiological investigations provided in Table 1.

Diagnostic nasal endoscopy revealed necrotic tissue in the right nasal cavity. Fungal culture from the tissue grew *Rhizopus arrhizus*, and histopathology showed broad aseptate hyphae with angio-invasion, confirming

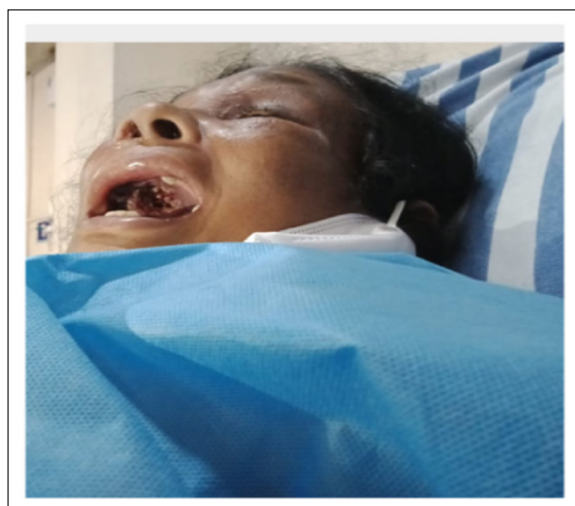


Figure 1. Face showing facial and periorbital edema with ulceration over palate

Table 1. Literature Review for Shigellosis

Parameter	Patient Value	Reference Range (Female)	Interpretation
Hemoglobin	9.9 g/dL	12–16 g/dL	Low (Anemia)
Total Leukocyte Count	23,100 /mm <sup>3</sup>	4,000–11,000 /mm <sup>3</sup>	Elevated (Leukocytosis)
Erythrocyte Sedimentation Rate (ESR)	145 mm/hr	0–20 mm/hr	Significantly Elevated (Inflammation)

Random Blood Sugar	455 mg/dL	<200 mg/dL	Markedly Elevated (Hyperglycemia)
Serum Ketones	1.9 mmol/L (Positive)	<0.6 mmol/L	Positive (Ketonemia)
Glycated Hemoglobin (HbA1c)	16%	<5.7% (non-diabetic)	Very High (Poor Glycemic Control)
Arterial Blood Gas (ABG)	High anion gap metabolic acidosis	Anion gap: 8–12 mEq/L	Metabolic Acidosis
Serum Creatinine	1.2 mg/dL	0.6–1.1 mg/dL	Mildly Elevated
Blood Urea	30 mg/dL	10–40 mg/dL	Within Normal Limits
Serum Ferritin	926 ng/mL	24-307 ng/mL	Elevated
Liver Function Tests	Normal (Albumin 3.6 g/dL)	Albumin: 3.5–5.0 g/dL	Normal
Chest X-ray	Normal bilateral lung fields	Clear lung fields	No Abnormalities Detected

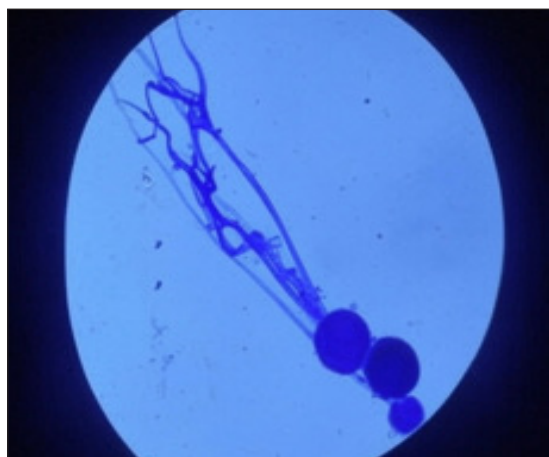


Figure 2(A). Electron-microscopic view showing Aseptate hyphae and sporangia of *Rhizopus arrhizus*

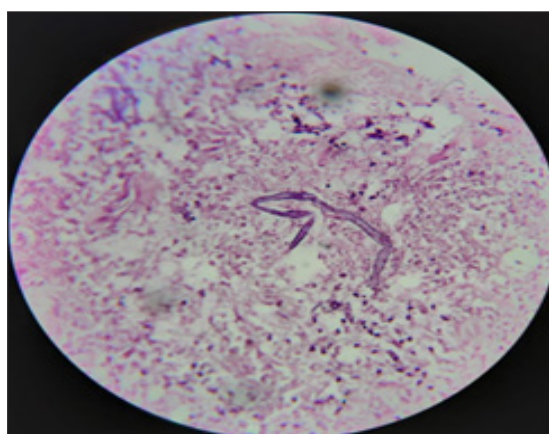


Figure 2(B). Histopathology with haematoxylin and eosin (H&E) stain showing broad aseptate hyphae with angio-invasion

### Management

The patient was managed in a multidisciplinary setting with endocrinology, infectious diseases, ENT, and ophthalmology

inputs. Diabetic ketoacidosis was corrected with intravenous fluids, insulin infusion, and electrolyte replacement.

She was started on intravenous liposomal amphotericin B (5 mg/kg/day), with close monitoring of renal function and electrolytes. Empirical antibiotics were initiated, and corticosteroids were avoided due to the active fungal infection and hyperglycaemia.

The ENT team performed endoscopic surgical debridement of necrotic nasal and palatal tissue. Repeated debridement was required due to extensive invasion.

Following two weeks of antifungal therapy, the patient showed clinical improvement with resolution of fever, reduction in facial swelling, and normalisation of blood glucose and acid-base status. She was discharged on oral posaconazole for maintenance therapy and scheduled for regular outpatient follow-up.

## Discussion

This case highlights the complex interplay between COVID-19, diabetes, and mucormycosis. Mucormycosis is an opportunistic infection that becomes highly aggressive in hyperglycaemic and acidotic environments. Diabetes mellitus impairs neutrophil chemotaxis and phagocytosis, while ketoacidosis provides an iron-rich milieu favourable to fungal growth.<sup>7,8</sup>

COVID-19, directly and indirectly, contributes to immune dysregulation and has been associated with increased incidence of invasive fungal infections.<sup>9</sup> The second wave in India saw a surge in cases of ROCM, with over 45,000 cases reported nationwide.<sup>10</sup> While corticosteroid overuse was initially implicated, subsequent cases in non-steroid-exposed individuals (like ours) highlighted the role of diabetes and viral-induced immunosuppression.<sup>11,12</sup>

COVID-19 reinfection is a relatively rare but increasingly documented phenomenon. Reinfection can present with mild or atypical symptoms or, as in this case, be unmasked during evaluation for other illnesses.<sup>6,13</sup> The overlap of symptoms between COVID-19 and secondary infections can delay diagnosis and worsen outcomes.

Early identification of mucormycosis relies on clinical suspicion and prompt ENT evaluation. Diagnostic nasal endoscopy and biopsy remain the gold standard for diagnosis.<sup>14</sup> Imaging (CT/MRI) helps assess orbital and cerebral involvement but was deferred initially due to haemodynamic instability in our patient.

Treatment involves three pillars: reversal of underlying metabolic derangements, surgical debridement, and antifungal therapy. Liposomal amphotericin B remains the drug of choice, though posaconazole and isavuconazole are options for step-down therapy.<sup>15,16</sup>

Our patient had multiple risk factors—uncontrolled diabetes, poor nutritional status, and possible COVID-19

reinfection—yet responded well to early surgical and medical interventions. Delay in diagnosis could have led to orbital involvement and CNS dissemination, which are associated with a high mortality rate of 50–80%.<sup>17</sup>

## Conclusion

This case underscores the importance of maintaining a high index of suspicion for mucormycosis in diabetic patients, especially in the post-COVID era. Early recognition of warning signs such as facial pain, periorbital oedema, and palatal ulceration is crucial. Timely initiation of antifungal therapy, surgical debridement, and meticulous glycaemic control can significantly improve prognosis. With the continuing evolution of the COVID-19 pandemic, clinicians must remain vigilant for secondary infections, even in those with mild or suspected re-infections.

**Conflict of Interest:** None

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