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# Ocular Manifestations of Mucormycosis in COVID-19 Patients in a Tertiary Care Hospital in Tamilnadu

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**Abstract:** ***This clinical study reports the various ocular manifestations of patients with mucormycosis in COVID-19 patients at a tertiary eye care center in Tamil Nadu. This was a single-center, hospital record based retrospective clinical study of 138 patients of both genders who were diagnosed to have mucormycosis between April 2021 and December 2021. We present this clinical study to stress the importance of early diagnosis and treatment of rhino-orbital mucormycosis and its complications and to emphasize the lesser number of exenteration done in our hospital.***

**Keywords:** Mucormycosis, ocular manifestations, Diabetes mellitus

## 1. Introduction

Mucormycosis is a rare angioinvasive fulminant form ofmycosiswith rapid progression usually beginning in the nose and paranasal sinuses following inhalation of fungal spores later involving orbit and central nervous system through direct spread. [1] It is caused by fungi of class zygomycetes, including genera as Absidia, Mucor, Rhizomucor, and Rhizopus. [2]

In India, the incidence of mucormycosis is approximately 140 cases per million population which is 80 times more than other developed countries.

The various risk factors for mucormycosis are uncontrolled diabetes mellitus, solid organ and haematological malignancies and transplantation, long-term corticosteroid and immunosuppressive therapy, chronic kidney disease, tuberculosis and AIDS. [3] Early identification of the disease and aggressive and prompt medical and surgical interventions helps in preventing the high morbidity and mortality associated with this disease process.

## 2. Materials and methods

This was a hospital record based, retrospective case series which analyzed COVID-19patients with mucormycosis admitted in our hospital, attending ophthalmology OPD from April 2021 to December 2021.

**Inclusion criteria:**
All age groups of both gender who tested positive for COVID-19 (either RTPCR or CT chest) and those patients reported in our hospital with symptoms suggestive of mucormycosis (positive for either KOH or culture) were included in the study.

**Exclusion criteria:**
Patients with KOH or culture negative for mucormycosis were excluded from the study

## 3. Methodology

After an in-depth ocular and systemic history taking, a complete ocular examination including assessment of best-corrected visual acuity, colour vision, visual fields by confrontation, Extra ocular movement, digital tonometry, slit-lamp biomicroscopy, and fundus examination with +90 D lens and indirect ophthalmoscopy with +20D lens was done. KOH and histopathological examination of biopsy specimen from nasal cavity was taken as supportive evidence of mucormycosis and all confirmed patients were treated with anti-fungal therapy.

## 4. Results

About 138 patients were included in the study. Mean age of presentation was 54.62 years. Chart 1 shows the age wise presentation of mucormycosis in our hospital.1 patient was in the 21 to 30 years age group, 18 in the 31 to 40 years age group, 33 in the 41 to 50 years age group, 38 in the 51 to 60 years age group, 39 in the 61 to 70 years age group, and 9 in the 71 to 80 years age group.

A total of 83 males (60.1%) and 55 females (39.9%) tested positive for mucormycosis.44 patients had Right eye involvement, 32 had Left eye involvement and 9 had Both eye involvement. Chart 2 shows the sex wise distribution and the eye involvement of mucormycosis in our hospital.

The frequencies of most common primary symptoms of ROCM were Facial/orbital pain (50%), Facial/orbital edema (33%), loss of vision (31.8%), nasal blockage (8.7%) and toothache (0.7%). Other symptoms were drooping of eyelids, protrusion of eyes, headache, diplopia, deviation of mouth and inability to close the eyelids. [3]

The frequency of most common primary signs of ROCM were Facial edema (33%), Loss of vision (31.8%), ptosis (31.8%), proptosis (31.8%), extraocular movement restriction (27%), facial palsy (6.5%), andnasal eschar (5.7%). Other signs were altered sensorium, facial discolouration, oral eschar and hypoasthesia of face. [3]

Among the 138 patients, 30 patients presented with preseptal cellulitis, 44 presented with orbital cellulitis, ptosis, and proptosis, 20 presented with orbital apex syndrome, 4 presented with panophthalmitis, 3 presented with cavernous sinus thrombosis, 2 presented with superior orbital fissure syndrome, 1 presented with orbital ischaemic syndrome, 1 with papilledema, 1 with optic neuritis and 1 with central retinal artery occlusion. Chart 3 shows the various ocular manifestations of mucormycosis seen in our hospital.

Among the 138 patients, 20 patients had optic nerve involvement, 46 patients had oculomotor nerve involvement both isolated and combined, 38 patients had trochlear nerve involvement, 44 patients had abducent nerve involvement both combined and isolated, 9 patients had facial nerve involvement, 2 patients had trigeminal nerve involvement, and 38 patients had total external ophthalmoplegia. Chart 4 shows the involvement of various cranial nerves in mucormycosis in our hospital.

Staging of ROCM was performed based on proposed staging system for ROCM as per Honavar SG et al. [3]It showed that 38.4% had stage less than 3b, 38.7% of patients had stage 3b, 16.6% had stage 3c, 4.3% had stage 3d and 2% had stage 4b.

10 patients died and 53 patients had no ocular manifestations.3 patients had cutaneous mucormycosis and 1 patient had pulmonary mucormycosis.

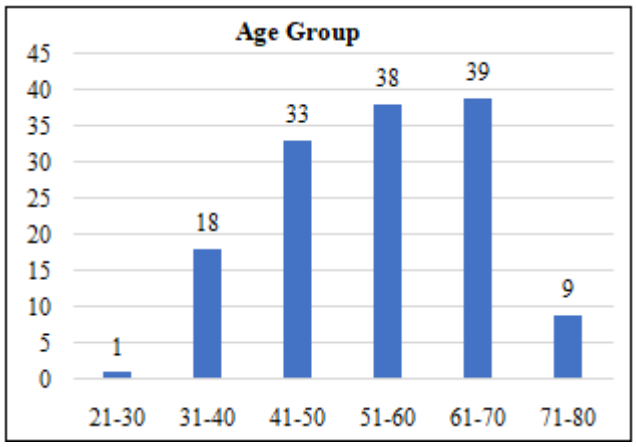
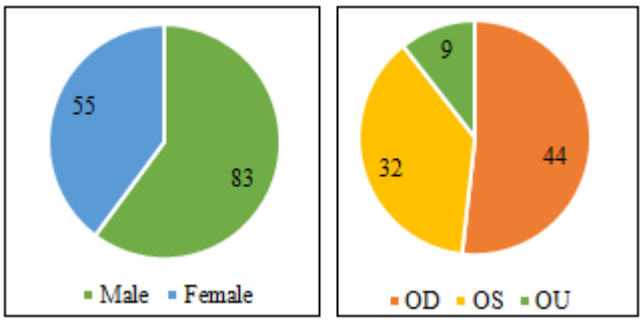



**Chart showing the age wise presentation of mucormycosis in our hospital.**




**Charts showing the sex wise distribution and the eye involvement of mucormycosis in our hospital.**

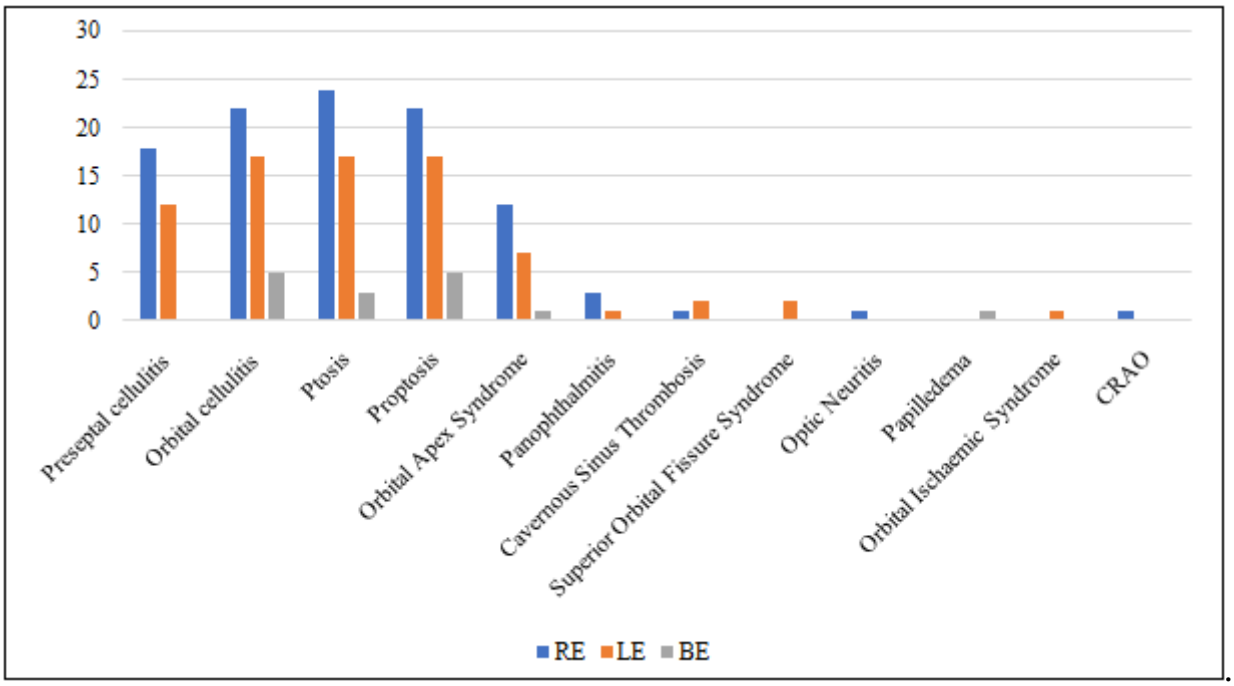



**Chart showing the various ocular manifestations of mucormycosis seen in our hospital.**

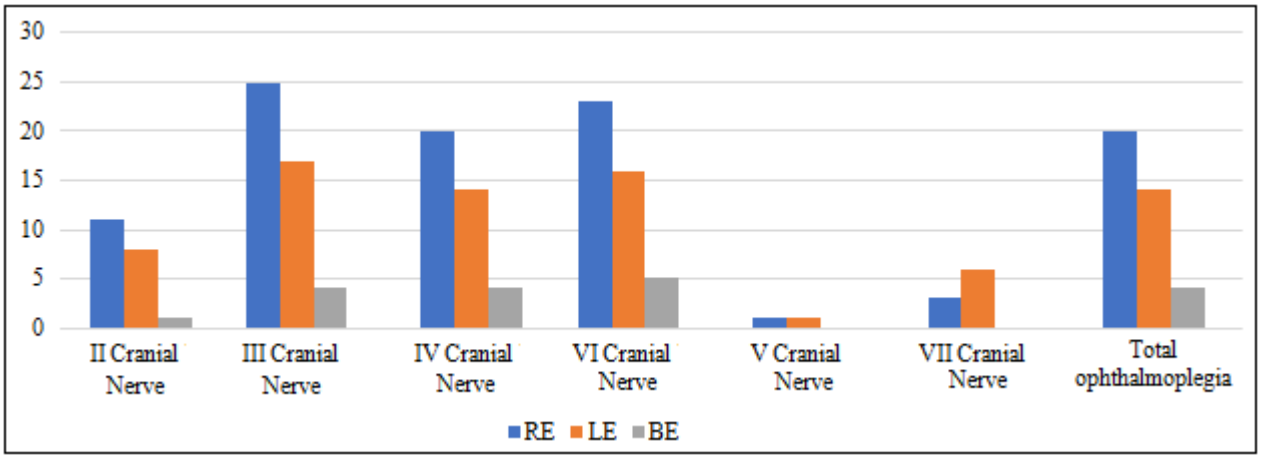



**Chart showing the involvement of various cranial nerves in mucormycosis in our hospital**

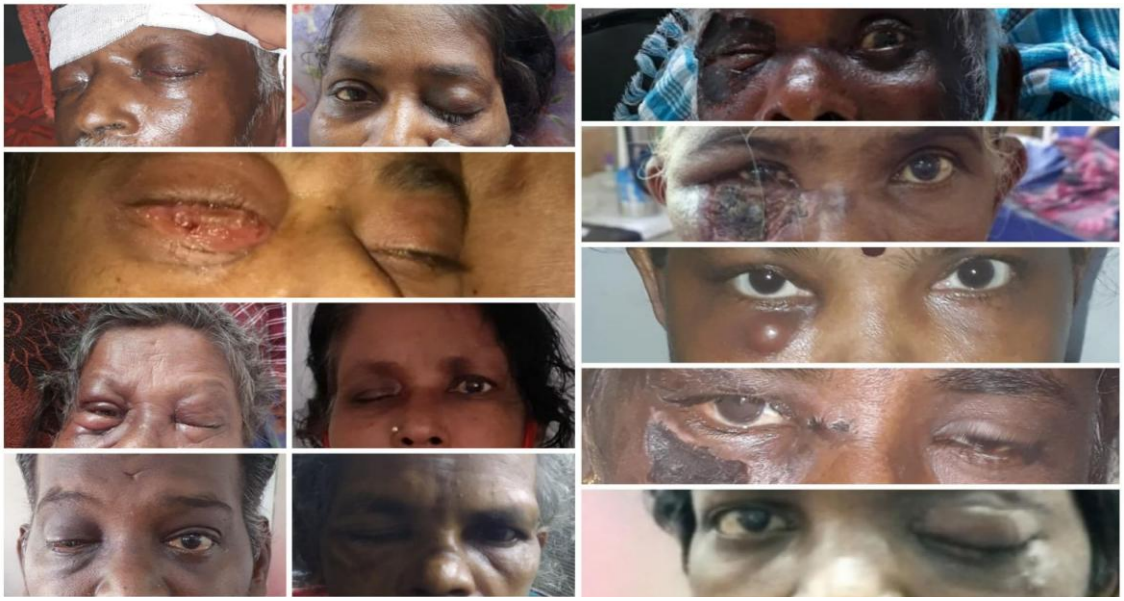


**Figure showing clinical pictures of mucormycosis patients in our hospital.**

## 5. Discussion

Mucormycosis is caused by a class of fungi that produce aseptate hyphae and reproduce both asexually and sexually by the formation of zygospores. The fungi which are usually avirulent become pathogenic only if the host resistance is exceptionally low. [4]

The airborne spores settle on the nasal mucosa of individuals with compromised cellular and humoral defense mechanisms, resulting in germination and development of hyphae. These hyphaeinvade the arteries, and penetrate the vessel walls and lumens causing thrombosis, ischemia, and infarction with dry gangrene of the affected tissues.

The clinical presentations of mucormycosis include rhinocerebral, pulmonary, cutaneous, gastrointestinal, disseminated, and miscellaneous forms. The rhinocerebral mucormycosis, the most common form of infection, presents with malaise, headache, nasal stuffiness, facial pain, and swelling and with low-grade fever, is usually seen in patients with uncontrolled diabetes mellitus. [5]

The disease usually starts within the nasal mucosa and extends to the paranasal sinuses spreading through the encompassing vessels like angular, lacrimal, and ethmoidal vessels, involving the retro-orbital region by direct extension. Hematogenous spread to other organs like cerebrum or lungs will be fatal for the patient. [5]

Deep nasal swab was taken in all patients and sent for direct microscopy with KOH and culture. Samples collected from FESS and endoscopic sinus debridement was also sent for histopathological examination. CT PNS with brain and orbital cuts were taken for all patients. MRI angiography was done in patients with central nervous system involvement. [6]

All the patients were proven ROCM according to the classification of COVID-19 associated ROCM described by Honavar SG et al. [3, 6] All patients had uncontrolled Diabetes mellitus. This issupported by Selim S et al [7], Ferry et al [8] and Yohai et al. [9]Some had hypertension, bronchial asthma, tuberculosis and chronic kidney disease as other co-morbidity.

Many patients first presented with nasal stuffiness, black discoloration of nasal mucosa, facial swelling followed by eyelid swelling and discoloration, facial pain, headache, proptosis, ptosis, sudden loss of vision, and diplopia.

Pulmonary mucormycosis patient presented first with preseptal cellulitis, confirmed with KOH and turned out to be culture positive for mucormycosis. He later presented with hemoptysis for which bronchoscopy was done and CT chest showed bilateral lung involvement suggesting of pulmonary mucormycosis and was referred to thoracic medicine department.

One patient presented with swelling in upper lids of both eyes and had mechanical ptosis for which excision biopsy was done which turned out to be antibioma.

One patient presented with orbital apex involvement of both eyes with involvement of central nervous system for which retrobulbar Amphotericin B, repeat FESS, endoscopic debridement, sinus wash with Amphotericin B and orbital decompression was done which improved the condition of the patient clinically.

Endonasal sinus debridement with Amphotericin B sinus wash was given in severe cases to reduce the fungal load in the sinuses and tissue sent for histopathological examination.

Transcutaneous retrobulbar Amphotericin B was given for severe cases confirmed by clinical and radiological methods and given in the corresponding affected areas. Most cases had medial rectus involvement and retrobulbar Amphotericin B was given in the medial compartment through the lower lid. One patient presented with mucormycosis following tooth extraction with involvement of inferior wall and hence retrobulbar Amphotericin B was given in the inferior compartment. Depending on the response, we repeat the doses of retrobulbar Amphotericin B. This turned out to be a boon in preventing exenteration in many patients.

Even after FESS, retrobulbar Amphotericin B and endoscopic debridement, recurrences occurred. So repeat FESS, endoscopic debridement and sinus wash with Amphotericin B was given.

Temporary tarsorraphy was done in patients with lagophthalmos and exposure keratopathy.

Four patients presented with panophthalmitis and central nervous system involvement for which exenteration (2.8%) was done. This is less compared to the study of Honavar SG et al which is 17% [6] and Seiff et al [10] in which 14% patients required exenteration.

Overall, exenteration was less in our hospital because of metabolic control, regular follow up, anti-fungal therapy with intravenous Amphotericin B followed by oral Posaconazole, repeated FESS, endoscopic debridement, sinus wash with Amphotericin B and multidisciplinary approach.

## 6. Conclusion

Early detection, antifungal therapy, surgical debridement, and control of risk factors such as diabetes mellitus should be implemented in all Mucormycosis patients which helps in reducing both morbidity and mortality in these patients. A high suspicion for mucormycosis in all suspected patients with proper staging, triaging and managing by multi specialists avoids delay in treatment and prevents morbidity and mortality in these patients. This study highlights the less number of exenteration in our hospital due to multidisciplinary approach.

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Nil

**Conflicts of interest**
There are no conflicts of interest.

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