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**Original Research Article**

# Clinical characteristics, management, and outcomes of post COVID-19 mucormycosis in a private ENT hospital in Surat: a retrospective analysis

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## ABSTRACT

**Background:** Objectives of the study were to assess the age group affected, common presentation, extent of disease of mucormycosis and treatment modalities in post covid patients.
**Methods:** All covid positive patients or recently recovered from covid with features of mucormycosis endoscopically and radiologically were included in this study. All patients that came in the outpatient department were screened using nasal endoscope and CT scans were performed. Patient's clinical findings and endoscopic findings were correlated with the scans during the pandemic and decision to operate the cases was taken. It was a team approach by otorhinolaryngologist, ophthalmologist, endocrinologist, intensivist and nephrologist. Patients were followed up to 1 year.
**Results:** 65 patients that suggested of mucormycosis clinically, endoscopically, and radiologically were studied. It included 50 (76.9%) males and 15 (23.1%) females and histologically after operating, mucor was present in 44 cases (67.6) and 9 (13.8%) were aspergillosis.
**Conclusions:** Post-COVID mucormycosis was reported after the second COVID wave in India especially after steroid therapies in diabetic patients. Thus, a timely, aggressive, team approach using Modified Denkers or open maxillectomy along with proper intravenous antifungals is the key to survival in such patients.

**Keywords:** Amphotericin, FESS, Mucormycosis

## INTRODUCTION

Mucor mycosis is an infectious disease caused by a fungus of the class of Zygomycetes and belongs to the order of Mucorales. It is a thermotolerant fungi. It is a ubiquitous fungus found in soil and decaying organic matter. It is not a contagious disease and does not spread by contact from person to person. Their mode of entry is via inhalation or ingestion or inoculation of spores. These spores usually grow in paranasal sinuses and can further extend to the orbit and the brain.[1] Main host defense in the body is neutrophils so patients with neutropenia are at highest risk. It is characterized by tissue necrosis that is caused by invasion of blood vessels and thrombosis. Immunocompromised patients can present with rapidly progressive necrotizing infection. Dissemination of infection to lungs or other sites is not very commonly seen but direct extension of disease to eyes, orbit, brain is seen and turns out to be very fatal. Thus, the prognosis of disease can be improved if patient is treated early.[2] Uncontrolled diabetics and excessive use of steroids (particularly those with a history of diabetic ketoacidosis) are also at risk.[3-5] Most common form is rhino-orbito-cerebral mucormycosis. Diagnostic methods include biopsy and fungal (KOH) staining. In microscopic examination, branching angle and septation determine the

type of species. Histopathological features of mucormycosis like angioinvasion, perineural invasion, abundant fungal hyphae help in assessing outcome at the time of diagnosis thus leading to early start of proper treatment. Imaging studies like CT scan can also support the diagnosis.[6] Most common symptoms are nasal congestion, nasal obstruction, facial pain and numbness, ocular pain, headache, chemosis, diplopia and loss of vision. The key to treatment is early and aggressive surgical debridement, along with high doses of intravenous antifungal therapy. Liposomal amphotericin B is the drug of choice and needs to be initiated on time. Posaconazole and Isavuconazole is used as second line treatment in mucormycosis.

## METHODS

### *Study method*

Observational Study was done.

### *Study place*

All patients at the tertiary health care institute.

### *Study duration*

The duration of the study was from February 2021 to December 2021.

### *Sampling technique*

We had roughly 200 cases, but in covid emergency and pandemic there was a lot of data missing, so we excluded the data with missing information.

### *Inclusion criteria*

All patients with history of COVID-19 infection and clinical features suggestive of mucor mycosis which were confirmed by endoscopic and CT scan findings were included in this study.

### *Exclusion criteria*

History was taken of all patients in their first visit. All patients were properly examined using a nasal endoscope. All patients underwent CT scan. In patients with orbit involvement, proper vision assessment with fundoscopic assessment was performed by the ophthalmologist. All patients underwent surgical debridement and injectable amphotericin for minimum 7 days and maximum 21 days (8 gm).

### *Ethical approval*

The study was approved by the Institutional Ethics Committee. The study is compliant with all the ethical standards. Informed research consent to participate was taken from all participants. Due consideration has been given not to ill harm or deprive any participant of the study via direct or indirect actions of the investigators or via conduct of the research.

### *Statistical analysis*

In this total 65 cases with proper data were included. Our data was entered in Microsoft excel and percentages and proportions were calculated.

## RESULTS

In our study, out of 65 patients of post COVID-19 mucormycosis,78.4% were males (n=51) and 21.5% were females (n=14) stating that males are at more risk of mucormycosis. In our study, 40 cases (61.5%) had diffuse facial pain exclusively, 11 cases (16.9%) had headache exclusively, 1 cases (1.5%) had bloody nasal discharge and headache, 2 cases (3.1%) had only conjunctival redness, 2 cases (3.1%) had numbness in face with facial pain, 3 cases (4.6%) had dental pain with facial pain, 2 cases (3.1%) had backache with headache, 1 case had (1.5%) facial pain and ptosis.1 case(1.5%) had headache with black discharge from nose, 2 cases (3.1%) had facial pain with headache. Total out of 65, 13 patients (20%) developed visual loss.

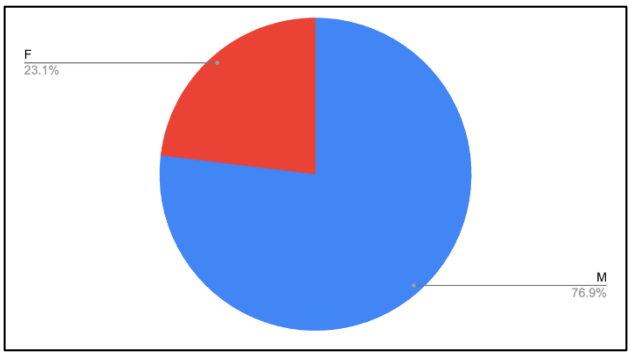


**Figure 1: Count of sex.**

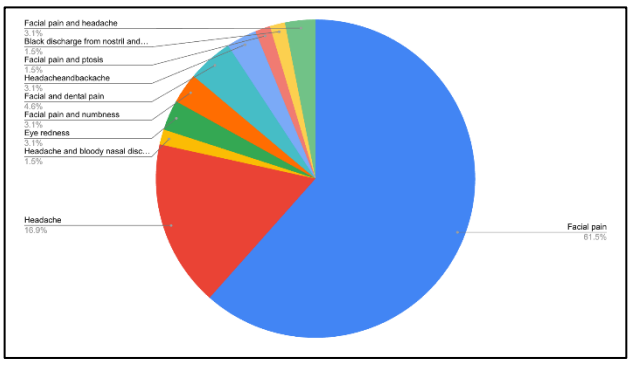


**Figure 2: Count of symptoms.**

In our study out of total patients, 33 cases (50.8%) were known case of diabetes with no other comorbidities ,1 case (1.5%) had TB meningitis ,1(1.5%) case had facial palsy since childhood along with diabetes, 1 case (1.5)

with CKD and diabetes, 1 case (1.5%) had hypothyroidism, diabetes, hypertension and IHD,1 case (1.5%) had diabetes and hypothyroidism,12 cases (18.5%) were recently detected diabetes in the hospital,6 cases (9.2%) had hypertension and diabetes, 9 cases (13.8%) had no co-morbidities.

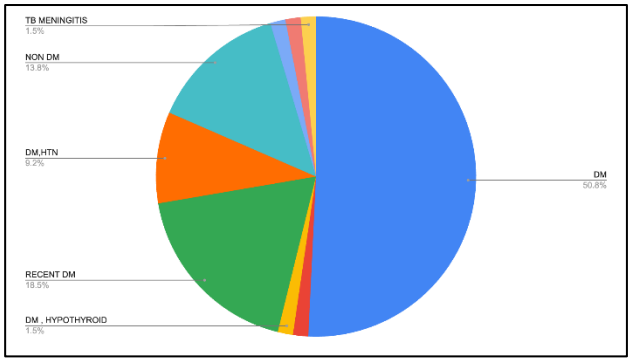


**Figure 3: Count of comorbidities.**

In our study histopathologically, 44 cases (67.6%) turned out to be mucuormycosis, 9 cases (13.8%) were aspergillus, 3 cases (4.6%) were both mucormycosis and aspergillus, 7 cases (10.8%) were acute on chronic inflammation, 2 cases (3.1%) were chronic inflammation.

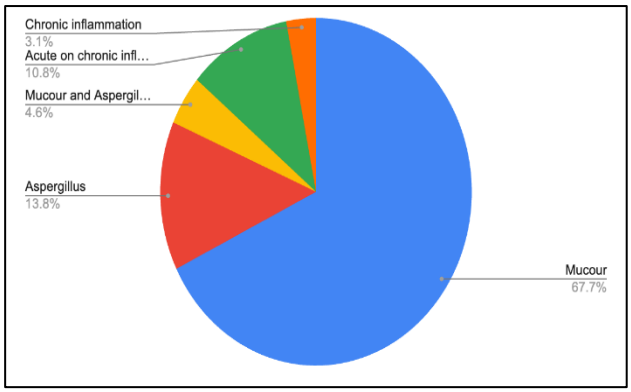


**Figure 4: Count of diagnosis.**

Second look FESS surgery was done in 6 cases within 2 months for the patients who had developed necrotic bone and sequestrum in hard palate, pterygoid plates, erosion of maxillary spine, alveolus, nasal septum.

## DISCUSSION

Males were more than females in, Aranjani et al as well as Satish et al who had similar findings in their critical review analysis and case series respectively.[5,6] In Pathak et al study, most common presentation was nasal obstruction in 80%, orbital swelling 70%, headache 65%, visual loss and diplopia 45%, fever 35%, epistaxis 30 % and nasal discharge 30% and disorientation 45%. In Pathak et al study out of the total patients, 73.9% patients had diabetes as a risk factor. Similar results were found in several case reports, case series as well as review analysis done across India. In Pathak et al study, 17.4% of patients had chronic kidney disease (CKD) as a comorbidity, 8.7% of patients had coronary artery disease (CAD) and 17.4% had hypertension.[10-12]

In Trivedi KR et al study, 67% patients had mucor species, 22% patients had aspergillus species in histopathology, 6% patients had both Mucor and Aspergillus species, 4% patients had Rhizopus species, only 1% patients had candida species.[12] In Pathak et al study, most common presentation was nasal obstruction in 80%, orbital swelling 70 %, headache 65%, visual loss and diplopia 45 %, fever 35%, epistaxis 30 % and nasal discharge 30% and disorientation 45%.[7]

All 65 patients coming to the tertiary care centre were active covid or recovered from COVID-19 with history of ingestion of oral steroids. Each patient was started with Injection amphotericin liposomal or lipophilic. After 2 doses of injection amphotericin patients underwent debridement and endoscopic maxillectomy with modified Denker's approach along with orbital clearance and alveolectomy wherever necessary. Tissue was sent for histopathology, fungal culture and sensitivity and KOH. Orbital exenteration was done by the oculoplastic surgeon. Nasal pack was kept for 3 days post operative. Patients were continued on Injection amphotericin till histopathological reports came.

Few patients were shifted to tablet voriconazole when histopathological reports came out to be aspergillus. After removal of pack, patients were started on nasal washes that continued till 6 months post operative. Repeat nasal endoscopy with suction and clearance of nasal cavity was done at 2,4,6,8 weeks and patients were followed up every 2 months thereafter up to 1 year. Injection amphotericin was given for minimum of 7 days and maximum for 21 days. After 8 gm of injection amphotericin, patients were shifted to tab Posaconazole for 3 months. One case showed resistance to injection amphotericin and voriconazole but responded to Isavuconazole.

### *Limitations*

Adequate information for all patients were not available and failure to follow them up and. Non collaboration with multisector or government sector for total covid cases and including only 65 cases in the study.

## CONCLUSION

Maximum cases of mucormycosis in India were seen in the second wave in the month of April 2021. All patients in our study were admitted in second wave. Patients with active covid, once suspected of mucormycosis were immediately taken for surgery in our centre with explained prognosis. Maximum cases were seen in cotton and rice farmers.

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*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

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