



## A STUDY OF CLINICAL AND IMAGING FEATURES OF RHINOCEREBRAL MUCORMYCOSIS IN TERTIARY CARE HOSPITAL

### Neurology

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### ABSTRACT

**Purpose :** Mucormycosis is an angio-invasive infection caused by group of fungi called Mucormycetes. Global prevalence of Mucormycosis range from 0.2- 95 cases per million population, whereas in India prevalence of Mucormycosis was nearly 140 cases per million population (1). Rhinocerebral mucormycosis is a commonest type of mucormycosis in Covid 19 patients who had diabetic history. This study aimed to determine the patients demographics, comorbidities, presenting symptoms and signs, imaging features, management and outcome. **Method :** This Study was conducted at ENT and Neurology department in the tertiary care hospital, Hyderabad during the period from May 2021 - July 2021. Out of 684 cases admitted, 72 cases were diagnosed as Rhinocerebral Mucormycosis during this period and were included in the study. After detail history and examination brain imaging was done and treatment given accordingly. Other types of mucormycosis and those who had not give consent were excluded from the study. **Results :** The mean age at the presentation was 44.8 years with male preponderance (81.95%). Diabetes mellitus was the most common comorbidity seen in 91.66%. History of steroid usage during covid infection was seen in 45.83% of patients. The most common presentation is swelling of periorbital area /cheek seen in 90.27% and the most common neurological finding is ophthalmoplegia seen in 66.6%. The most common MRI imaging finding is cavernous sinus involvement in the form of T2/FLAIR Hyperintensity and T1 contrast enhancement seen in 72.2%. Overall treatment included intravenous amphotericin B and FESS in 100% of patients, Maxillectomy and enucleation done in 16.6 and 13.8% respectively. 70 patients recovered and 2 died due to sepsis with septic shock.

### KEYWORDS

### INTRODUCTION

Mucormycosis is caused by molds belonging to order Mucorales, which is seen on the soil, plant surface, vegetables, fruits and animal manure. It causes serious Angio-invasive infection by group of fungi called Mucormycetes.<sup>1, 8</sup> Infection occurs mainly in Immuno-compromised patients, uncontrolled diabetics, patients with solid organ transplantation, patients on long term systemic corticosteroid, immunomodulating drugs and deferoxamine or desferrioxamine, HIV, Intravenous Drug abusers, prolonged neutropenia, severe burns, open wound following trauma.<sup>1</sup> Fungal infections like Aspergillosis, Mucormycosis, Candidiasis are common in post covid patients with uncontrolled diabetics and who were treated with systemic corticosteroids.<sup>1</sup> There are 5 types of Mucormycosis namely Rhinocerebral Mucormycosis, Pulmonary Mucormycosis, Gastrointestinal Mucormycosis, Cutaneous and Disseminated Mucormycosis.<sup>(2)</sup> During second Wave, Covid-19 disease caused lot of secondary infections of which mucormycosis was the commonest. This study mainly concentrated on Rhinocerebral mucormycosis which is also the most common type of Mucormycosis.

Global Incidence of Mucormycosis ranges from 0.005 to 1.7 per million population.<sup>1</sup> Global prevalence ranges from 0.2- 95 cases per million population whereas in India prevalence of Mucormycosis was nearly 140 cases per million population.<sup>3</sup>

Rhinocerebral mucormycosis is commonest type of mucormycosis in Covid 19 patients who had diabetic history. Most common symptoms include Fever, Lethargy, Unilateral facial swelling, Headache, Nasal congestion, Black lesions on nasal bridge or Hard palate etc.<sup>1,2</sup> Infection initially starts at the nasal turbinate, and rapidly spreads to involve the sinuses, palate, orbit, and brain. The fungus has strong affinity for blood vessels and invades them resulting in tissue ischemia and necrosis.<sup>4</sup> Infection can spread from sinuses, to bones leading to osteomyelitis and also spreads to the orbital structures and brain. Infection spreading to cavernous sinus can lead to cranial nerve palsies<sup>5</sup>

Mucormycosis can be diagnosed by tissue biopsy, histopathological examination and radiological examination by CT and MRI. Treatment is mainly Medical with Liposomal Amphotericin B and Posaconazole. Extensive involvement of Orbits and cerebral area may require surgery. Mortality rate in patients with Rhinocerebral Mucormycosis

ranges from 25% to 62% whereas good prognosis is seen in patients in which disease is restricted to sinuses alone.<sup>6</sup>

Early diagnosis of Mucormycosis is necessary and early initiation of antifungals may protect from further spreading of the disease and hence can prevent death. In this study we described various neurological manifestation of Rhinocerebral mucormycosis.

<sup>6</sup>The 1950 Smith and Krichner criteria for the clinical diagnosis of mucormycosis are still considered to be gold standard and include:

- (i) Black, necrotic turbinate's easily mistaken for dried, crusted blood,
- (ii) Blood-tinged nasal discharge and facial pain, both on the same side,
- (iii) Soft peri-orbital or peri-nasal swelling with discoloration and induration,
- (iv) Ptosis of the eyelid, proptosis of the eyeball and complete ophthalmoplegia and,
- (v) Multiple cranial nerve palsies unrelated to documented lesions

### AIM AND OBJECTIVES

To study the various neurological manifestation in patients with Rhinocerebral mucormycosis after covid infection who presented to our Hospital and informed consent was taken.

### METHODOLOGY

This is the observational Study conducted in ENT and Neurology department at tertiary care hospital, Hyderabad during period from May-July 2021. Out of 684 patients of mucormycosis, 72 has neurological manifestations and were included in the study and patients with other types of mucormycosis and those who did not give consent were excluded from the study. After Detail history and examination, brain imaging and other necessary investigations were done and treatment given accordingly.

### RESULTS

Out of 684 patients, 72 has central nervous system involvement and were included in the study. Age of presentation ranges from 21 to > 70 years. Patients between age group of 41-50 (40.28%) years were the major proportion. Age distribution of patients is depicted in the Figure 1. Males (59) are predominant than female (13), sex distribution is depicted in the Figure 2. History of steroid usage is seen

in 33 patients ( 45.9 % ) . Most common comorbidity associated with Rhinocerebral mucormycosis is Diabetes mellitus seen in 91.66% of patients , of which 43.93 % were de novo diabetic followed by Hypertension ( 29.16% ) , Cerebrovascular disease ( 8.33% ) ,CAD ( 6.94 % ) . Most common presentation is swelling of periorbital area / cheek 90.27 % and the most common neurological finding is ophthalmoplegia seen in 66.6 % . The most common MRI imaging finding is cavernous sinus involvement in 72.2 % followed by Intra orbital involvement ( 44.4% ) . Overall treatment included intravenous amphotericin B and FESS in 100% of patients, Maxillectomy and enucleation done in 16.6 and 13.88 % respectively .Two patients died due to the Complication of sepsis with septic shock and multiorgan failure.

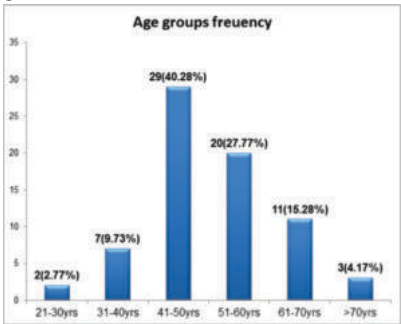


Figure 1: Distribution Of Study Population According To Their Age Groups. (n=72)

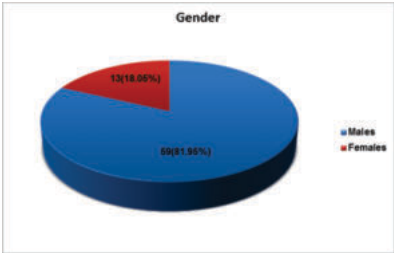


Figure 2: Distribution Of Study Population According To Their Gender. (n=72)

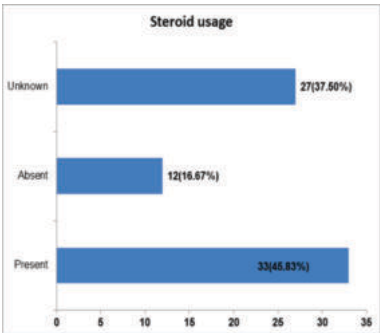


Figure 3: Distribution Of Study Population According To History Of Steroid Usage(n=72).

Table 1: Distribution Of Study Population According To Symptoms, Comorbidities, Clinical Features, Mri Findings, Treatment & Prognosis (n=72)

| COMORBIDITIES                      | No of patients (n) | Percentage( %) |
|------------------------------------|--------------------|----------------|
| Known Diabetes mellitus            | 37                 | 51.3           |
| Newly detected diabetes            | 29                 | 40.27          |
| Hypertension                       | 21                 | 29.1           |
| Old CVD                            | 6                  | 8.3            |
| CAD                                | 5                  | 6.9            |
| Hypothyroidism                     | 4                  | 5.5            |
| H/o seizures                       | 2                  | 2.7            |
| SYMPTOMS                           | No of patients (n) | Percentage( %) |
| Swelling of periorbital area/cheek | 65                 | 90.2           |
| Headache                           | 30                 | 41.6           |
| Nasal                              | 23                 | 31.9           |
| Decreased vision                   | 22                 | 30.5           |

| Weakness of limbs                   | 9                           | 12.5           |
|-------------------------------------|-----------------------------|----------------|
| Deviation of the angle of the mouth | 6                           | 8.3            |
| Seizures                            | 3                           | 4.1            |
| Difficulty in swallowing            | 1                           | 1.3            |
| CLINICAL FEATURES                   | No of patients (n)          | Percentage( %) |
| Ophthalmoplegia                     | 48                          | 66.6           |
| Facial nerve palsy– LMN             | 18                          | 25             |
| Hemiparesis                         | 9                           | 12.5           |
| Facial nerve palsy - UMN            | 4                           | 5.5            |
| CN 9,10 involvement                 | 1                           | 1.3            |
| MRI FINDINGS                        | No of patients (n)          | Percentage( %) |
| Cavernous sinus involvement         | 52                          | 72.2           |
| Intraorbital Extension              | 32                          | 44.4           |
| Dural enhancement                   | 27                          | 37.5           |
| Lobe involvement                    | 15                          | 20.8           |
| Infarcts                            | 24 (16 acute and 8 chronic) | 33.3           |
| Abscess                             | 3                           | 4.1            |
| Osteomyelitis( Frontal Bone)        | 3                           | 4.1            |
| FESS+ AMPHOTERICIN B alone          | 50                          | 69.4%          |
| FESS + AMPHOTERICIN B+ MAXILLECTOMY | 12                          | 16.6           |
| FESS+ AMPHOTERICIN B+ ENUCLEATION   | 10                          | 13.8           |
| PROGNOSIS                           | No of patients (n)          | Percentage( %) |
| RECOVERED & DISCHARGED              | 70                          | 97.2           |
| DEATH                               | 2                           | 2.7            |

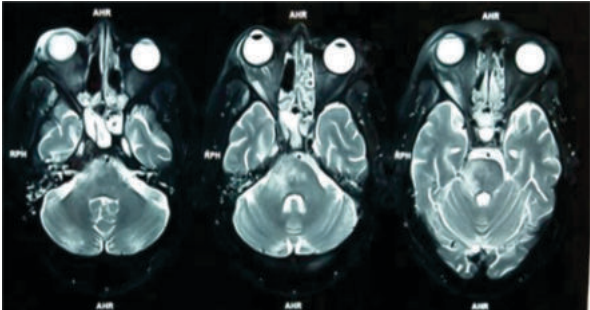


Figure 4 : T2 Axial Mri Of A 50 Year Old Male Patient Of Rhinocerebral Mucormycosis Showing Involvement Of Ethmoid And Sphenoid Sinus And Hyperintensities In Right Middle Cerebellar Peduncle ,right Pons Suggestive Of Infarct .

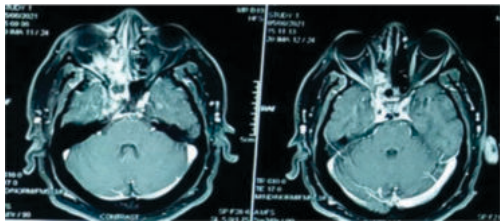


Figure 5: This Is The T1 Contrast Mri Brain Showing Enhancement Of The Lesion In Right Ethmoid Sinus And Cavernous Sinus .

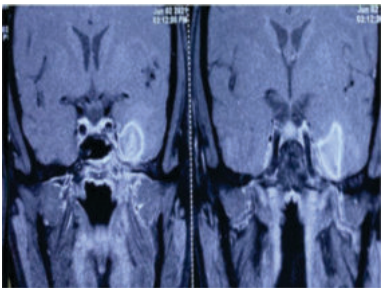
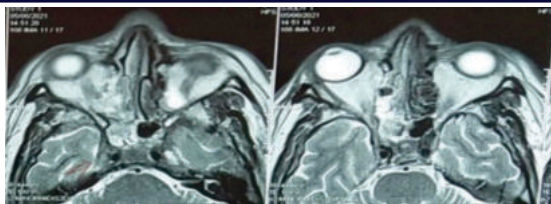


Figure 6: this Is The T1 Contrast Of The Mri Brain Showing Ring Enhancing Lesion In Left Temporal Lobe Suggestive Of Abscess Formation



**Figure 7: This Is A T2 Mri Brain Of 60 Yr Old Male Presented With Right Eye Swelling Showing Involvement Of Right Ethmoid Sinus With Intra Orbital Extension**

## DISCUSSION

The epidemiology of mucormycosis in India is different from western countries,<sup>8,9,10</sup> Uncontrolled diabetes mellitus is the predominant risk factor in India where as in developed countries hematological malignancy, organ transplantation are the major risk factors.

<sup>11</sup> In India , 2019 a nationwide multi-center study of 388 cases of mucormycosis was done .Predominant Risk factors observed in this study were Diabetes in 56.8% of the patients , followed by Solid organ transplantation (n = 19, 6.3%), hematological malignancy (n = 19, 6.3%) and long term steroid therapy (n=30, 9.9%) .

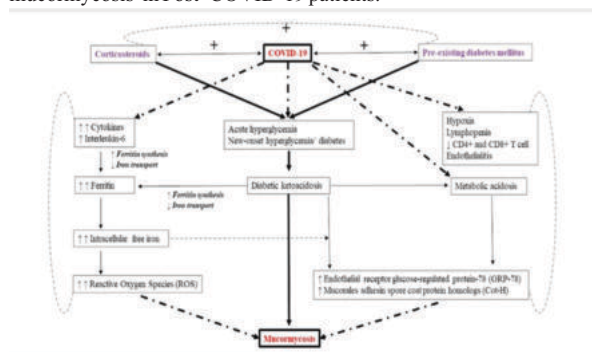
<sup>12</sup> John et al studied 41 cases of post covid mucormycosis .In this study , DM was the most common comorbidity observed in (38/ 41 ) 93% of cases followed by steroid usage ( 36/41) 88% .

<sup>14</sup>A.K. Singh et al , series of 101 mucormycosis cases in Covid-19, where 80% cases had DM, and more than two-third (76.3%) received a course of corticosteroids.

These findings are consistent with our study , DM was observed in 66 out of 72 ( 91.7 % ) patients and steroid usage was seen in 33 / 72 ( 45.8%)

Collectively, these findings suggest a familiar connection of mucormycosis, diabetes and steroid usage , in Post -COVID-19 patients.

Fig depicts the postulated mechanism of increased propensity for mucormycosis in Post-COVID-19 patients.



### Figure 8 : Postulated Interaction Of Diabetes, Corticosteroids And Covid 19 In Mucormycosis

<sup>14</sup>A.K. Singh et al., Male (78.9%) were predominant than female.

<sup>12</sup>John et al , Thirty-four (83%) were males with a median age of 55 years .This is in consistent with the present study ,males 59/72 ( 81.95 ) were predominant than females .

<sup>13</sup>Mishra N et al, Orbital involvement was seen in 6/10 patients ( 60%)

<sup>16</sup> Jindal G et al invasion was seen in 11 (73%) of 15 patients . In contrast, our study showed cavernous sinus involvement was seen in 72.2 % ( 52/72 ) followed by intraorbital extension 58% ( 42/72 )

<sup>14</sup>A.K. Singh et al , Overall mortality was noted in 30.7%( 31 /101 ) of the cases .

<sup>15</sup> Vahid et al ,mortality rate was 28% ( 230 /821 ) . In contrast , our study showed low mortality rate of ( 2.7 % ) , 2 / 72 died due to sepsis with septic shock .

## CONCLUSION

Covid associated mucormycosis have varied presentation which needs high level of suspicion from clinicians .Uncontrolled diabetes and injudicial use of steroids predisposed to the rhino orbital cerebral mucormycosis . Early diagnosis and ,management improves the outcome of the patients and mortality is high with the cerebral involvement.

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