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## Study Of Clinical Features, Management And Microbiological Profile Of Fungal Sinusitis In Post Covid And Non Covid Patients.

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### ABSTRACT

Patients with COVID-19 are more susceptible to coinfections with fungi. The invasive fungal infection is commonly seen in immunocompromised and diabetics. Mucormycosis is a fatal disease with high mortality and morbidity. Hence, early diagnosis and management helps to prevent mortality. Our study is a Retrospective study. The main aim is to determine the epidemiology, risk factors, clinical presentation and diagnosis & management of fungal sinusitis and to determine the various microbiological species associated with post covid and non-covid patients. The study includes 70 suspected patients of mucormycosis. Out of which 52 were Post covid and 18 were Non covid persons. 64.2 % received steroids and 45.7 % received oxygen during COVID-19 management. Diabetes mellitus was the most common comorbidity with 94% followed by hypertension. Sinonasal involvement were the most common site followed by orbit and facial pain (91.4%) was the most common presentation. Nasal and oral specimens were sent for KOH mount, fungal culture and sensitivity. The surgical procedure was carried out based on the clinical and radiological extent of the patient. The results concludes with culture positive Mucormycosis was found in 30 (42.85%). Out of which Rhizopus was the predominant species in 22 (31.42%) followed by Aspergillus 14 (20%). The patients who underwent surgery were on routine follow-up for 6 months

**Keywords:** COVID-19, Diabetes mellitus, Mucormycosis, Rhizopus

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## INTRODUCTION

Fungal rhinosinusitis was first categorised by the causative agent, such as aspergillosis, mucormycosis, etc. When Hora first identified two major categories in 1965, the focus shifted from the pathophysiology of the disease process to the causal organism. These are either invasive or non-invasive depending on whether the fungal hyphae have the ability to penetrate the epithelium and enter the tissues (invasive) or whether the infection is limited to the superficial epithelium (non-invasive). Invasive FRS can cause severe tissue invasion via mucosa, bone, neurovascular systems, and adjacent organs, as its name implies. There is considerable variation in the disease's chronicity like Acute-less than 4 weeks and Chronic-more than 4 weeks

### **Non-invasive fungal sinusitis:**

- Saprophytic fungal infection
- Fungal ball
- Allergic fungal rhinosinusitis (AFRS)

### **Invasive fungal sinusitis:**

- Acute invasive fungal sinusitis
- Chronic invasive fungal sinusitis
- Chronic granulomatous invasive fungal sinusitis

A genus of fungus known as mucormycetes causes the uncommon but serious angio-invasive infection known as mucormycosis (formerly known as zygomycosis). Mucormycosis primarily affects immunocompromised individuals. Diabetes (particularly diabetic ketoacidosis), solid organ transplantation, neutropenia, chronic systemic corticosteroid use, hemochromatosis. HIV-positive individuals and those using immunosuppressive medications are at a high risk. Organ involvement is used to classify clinical presentations. It can be rhino-orbital cerebral, pulmonary, cutaneous, gastrointestinal or disseminated. Mucormycosis is a dangerous, aggressive infection that needs quick identification and treatment. Surgery and antifungal medicines are frequently used as treatments.

### **Mucormycosis linked with COVID-19:**

Patients with severe COVID-19 or those who are recovering from the condition have been reported to have fungal infections, including mucormycosis, aspergillosis, and invasive candidiasis, which have been linked to serious sickness and mortality.

Those post-Covid-19 individuals who have a history of poorly controlled diabetic mellitus, are immuno-compromised, and have received steroid and other pharmacological treatment for Covid-19 are more susceptible to mucormycosis.

Improved glycaemic control in COVID-19 patients and careful monitoring of the administration of systemic corticosteroids in the treatment of severe cases should be the main goals of COVID-19 linked mucormycosis prevention.

## MATERIALS AND METHODOLOGY

The ENT department of the Government Thoothukudi Medical College and Hospital conducted this study. The study includes patients with covid 19 RTPCR positivity before the commencement of clinical and radiographic signs of invasive rhino sinusitis as well as non-covid patients. According to procedure, a full ENT examination, a thorough history review, and investigation and management was carried out. Nasal and oral Specimens were sent in sterile normal saline leak proof containers for Microbiological analysis -KOH mount and fungal culture by LPCB [LactoPhenol Cotton blue]. Treatment involved open, endoscopic debridement and combined methods. The surgical procedure will be carried out based on the clinical and radiological extent of the patient and Antifungal therapy like parenteral liposomal amphotericin-B and oral posaconazole were given. Throughout the monitoring phase the treated patients will continue to get periodic endoscopic assessments. The patients who underwent surgery were followed up for 6 months.

We had taken a research sample of about 70 cases. We included patients of both sexes of middle and old age people with both Clinical and endoscopically suspected with Positive findings in CT scan/MRI PNS. We excluded Childrens, Prior history of nasal tumours and Prior history of nasal surgery [1-12]

## DISCUSSION

The incidence of invasive and non-invasive fungal sinusitis among different age and sex groups was analyzed.

Among the Total 70 cases, 52(74.28%) were Post covid and 18 (25.7%) were found to be Non covid [Figure 1] Out of which Sex distribution was found to be 43 males and 27 females were affected [Figure 2] indicating that the predilection of disease is higher among males.

Age distribution [Figure 3] was one patient in the age group of 21–30 years with no comorbidities. In the age group of 31–40 years, 8 individual was affected. There were 22 in the age group of 41–50 years, 20 in the age group of 51–60 years, 17 patients in the age group of 61–70 years, 2 patients in the age group of 71–80 years.

Hence, we concluded that predominant age group affected between 41 -50 years of age followed by 51-60 years.

**Co-morbidities [Figure 4]** Uncontrolled diabetes mellitus [94%] is the most commonly associated comorbid condition/high- risk factor followed by systemic hypertension, coronary artery disease, chronic kidney disease hepatitis B infection, pulmonary tuberculosis.

**Figure [5]** Sinonasal region (100%) is found to be commonly followed by orbital (28.5%), palatal (15.7%) and cerebral (4.2%) involvement.

### Clinical presentation [Table 1]

- The most common clinical presentation in **Sinonasal** involvement was **facial pain** seen in 64(91.42%) patients, facial swelling [picture 1] in 42 patients, headache in 38 patients, nasal obstruction in 15 patients.
- In **Orbital** involvement orbital swelling seen in 20 patients [picture 2], visual disturbance seen in 11 patients.
- In **Palatal** involvement palatal discoloration [picture 3] seen in 9 patients, loosening of teeth in 6 patients and 4 patients presented with oroantral fistula.

In **CNS** involvement 3 patients presented with facial nerve palsy and cavernous sinus thrombosis.



Picture 1: Right sided facial swelling



Picture 2: Left periorbital swelling



**Picture 3: Palatal discolouration**

**Management [Figure 6]**-Out of 70 patients, surgical intervention Endoscopic sinus surgery was done in 5 patients (86%), Endoscopic sinus surgery with partial maxillectomy done in 4 (6%), Endoscopic surgery with palatal repair in 4 (6%), 3 patients were not surgically intervened due to the patients poor general condition and were died and 3 patients with ROCM with cavernous sinus involvement were referred to higher centre. Orbital involvement patients were managed with retrobulbar amphotericin injection. 62 patients fully cured. on regular follow up no recurrence was found on this 62 patients.

**Fungal culture- Mucormycosis [Figure 7]** :Microbiological analysis by LPCB MOUNT in microscopic examination demonstrates a total of 30 (42.85%) cases of Mucormycosis .Out of which 22 Rhizopus-picture (4), 5 Mucor-picture (5), 1 Rhizomucor, 1 Absidia-picture (6) and 1 shows mixed of Aspergillus and Syncephalastrum- picture (7) .

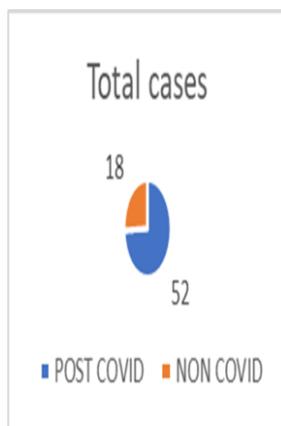
Macroscopically on SDA demonstrates cotton wool colonies with salt and pepper appearance. picture (8).

**Fungal culture -Aspergillus [Figure 8]**

Out of total 70 cases, 14 were culturally positive for aspergillus species.

Out of which Aspergillus flavus constitutes the predominant species of 8 (11.4%) followed by Aspergillus niger 4 (5.7%), Aspergillus fumigatus 1 (1.4%), Aspergillus nidulans 1 (1.4%)

Other species were found in 6 .Out of which 2 had candida albicans, 2 had Dematiaceous fungi of Bipolaris and Alternaria species, 1 had Paecilomyces and 1 had Scedosporium. 20 persons fungal culture shows no growth in fungal culture



**[Figure 1]**



**[Figure 2-Males-43, Females-27]**

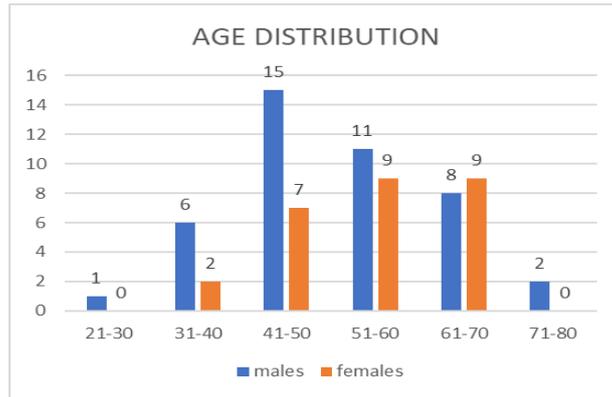
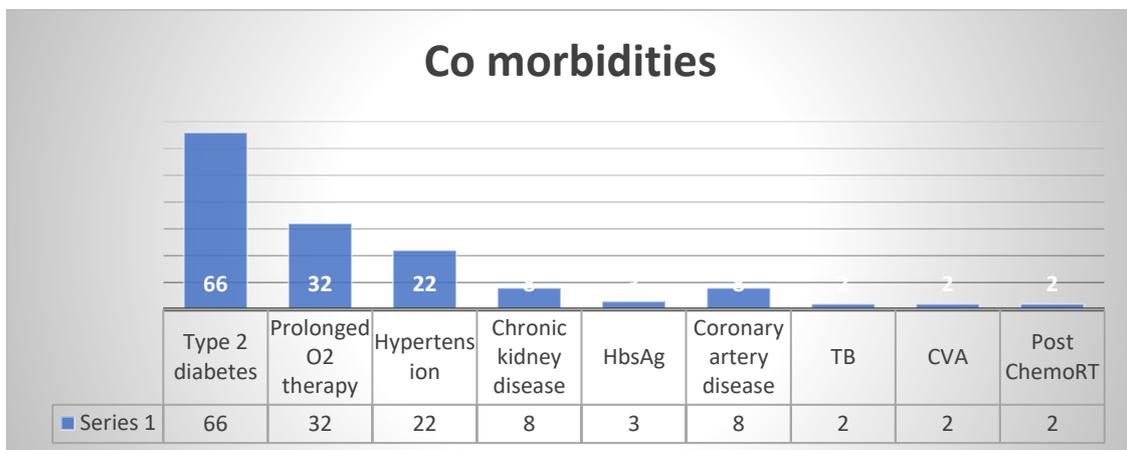


Figure 3: Age and sex distribution



[Figure 4: Diabetes is the common comorbidity

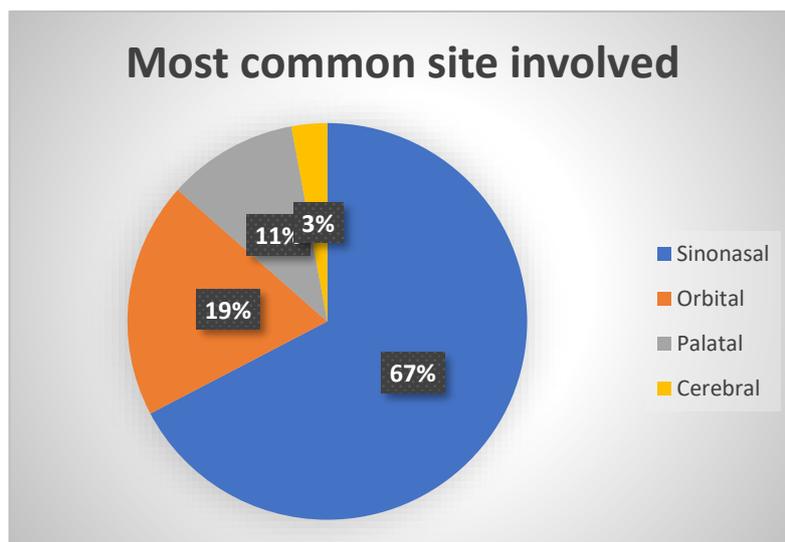
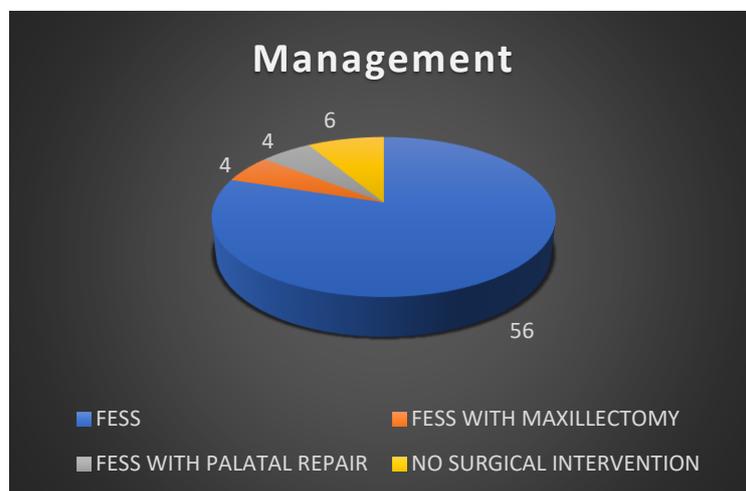


Figure 5

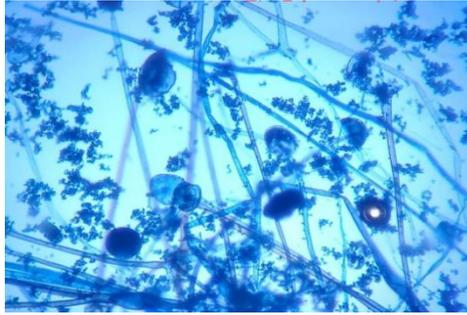
S.No	Clinical presentation	Number of Persons affected
1	Facial Pain	64
2	Facial Swelling	42
3	Headache	38
4	periorbital Swelling	20
5	Nasal Obstruction	15
6	Visual disturbances	11
7	Palatal Discoloration/ Ulceration	9
8	Loosening of Teeth	6
9	Trismus	4
10	Oro Antral Fistula	4
11	Facial palsy	3

**Table 1: Clinical presentation**



**Figure 6**

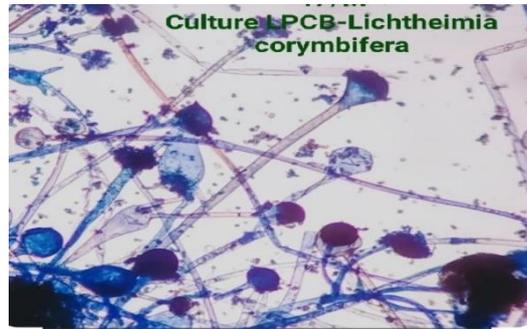
**FUNGAL CULTURE -Various species of mucormycosis**



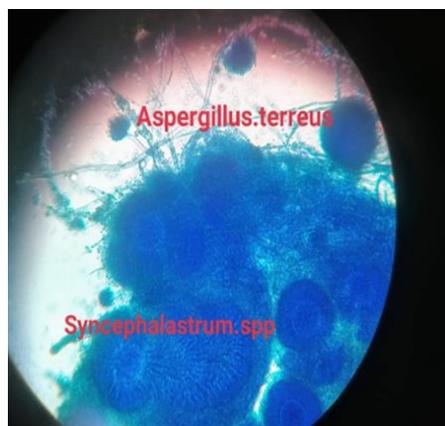
**Picture 4: Rhizopus species-pigmented rhizoids and sporangiospore seen]**



**Picture 5: Mucor species without rhizoids]**



**Picture 6: Absidia-sprongiospores arises between rhizoids and carry pyriform shaped sporangia]**



**Picture 7: mixed of Aspergillus terreus and Syncephalastrum]**

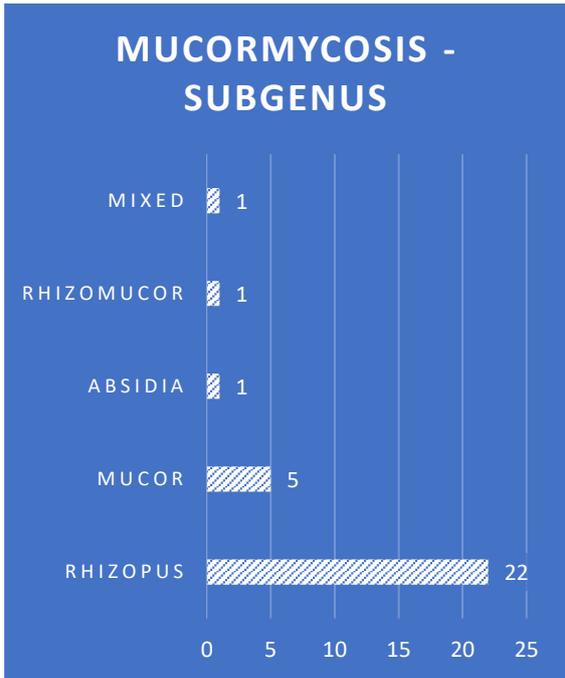


Figure: 7



Picture 8: Sabouraud dextrose agar-cotton [Wool colonies with salt & pepper appearance]

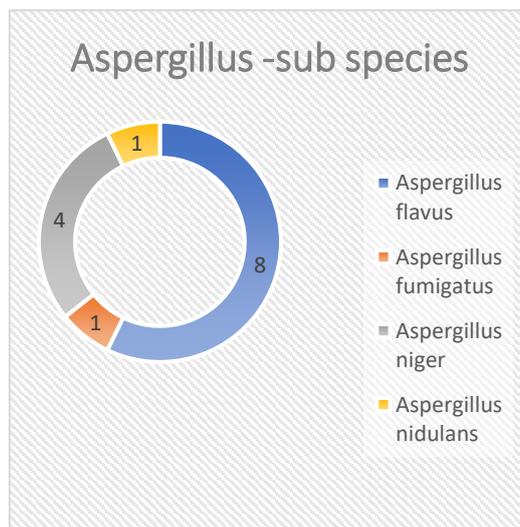


Figure 8



**Picture 8: Diagnostic nasal endoscopy of Invasive mucor infection showing-black middle turbinate**  
**Picture 9: Diagnostic nasal endoscopy of Non invasive fungal showing fungal ball**

### CONCLUSION

Increase in mucormycosis in post covid patients makes judicious use of steroids and control of diabetes in order to reduce the burden of fatal mucormycosis. Patients with uncontrolled diabetes mellitus or immunocompromised state who are COVID or non-COVID patients must have a clinical suspicion of acute fungal sinusitis. Patients with COVID-19, especially those at high risk, must be monitored by ENT after recovery. A successful outcome requires a high index of clinical suspicion, early diagnosis, rigorous glycemic control, aggressive surgical debridement, and the use of antifungal medications.

### REFERENCES

- [1] American journal of respiratory and critical care medicine. 2005;172(9):1169-227. <https://doi.org/10.1164/rccm.2508001>.
- [2] Cohen J. Wuhan seafood market may not be source of novel virus spreading globally. Science. 2020;10(10.1126).
- [3] Chen J. COVID-19 Scientific Advisory Group Rapid Response Report. Alberta Health Services. 2020.
- [4] WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. World Health Organization (WHO). 2020.
- [5] Ferguson BJ. Mucormycosis of the nose and paranasal sinuses. Otolaryngologic Clinics of North America. 2000;33(2):349-65. [https://doi.org/10.1016/S0030-6665\(00\)80010-9](https://doi.org/10.1016/S0030-6665(00)80010-9).
- [6] Bengoechea JA, Bamford CG. SAR-CoV-2, bacterial co-infections, and AMR: the deadly trio in COVID-19?. EMBO molecular medicine. 2020;12(7):e12560. <https://doi.org/10.15252/emmm.202012560>.
- [7] Kumari A, Rao NP, Patnaik U, Malik V, Tevatia MS, Thakur S, et al. Management outcomes of mucormycosis in COVID-19 patients: A preliminary report from a tertiary care hospital. medical journal armed forces india. 2021;77(2):S289-95. <https://doi.org/10.1016/j.mjafi.2021.06.009>.
- [8] Ferguson BJ. Mucormycosis of the nose and paranasal sinuses. Otolaryngologic Clinics of North America. 2000;33(2):349-65. [https://doi.org/10.1016/S0030-6665\(00\)80010-9](https://doi.org/10.1016/S0030-6665(00)80010-9).
- [9] Werthman-Ehrenreich A. Mucormycosis with orbital compartment syndrome in a patient with COVID-19. The American journal of emergency medicine. 2021;42:264-e5. <https://doi.org/10.1016/j.ajem.2020.09.032>.
- [10] Honavar SG. Code mucor: guidelines for the diagnosis, staging and management of rhino-orbito-cerebral mucormycosis in the setting of COVID-19. Indian journal of ophthalmology. 2021;69(6):1361-65. [https://doi.org/10.4103/ijo.IJO\\_1165\\_21](https://doi.org/10.4103/ijo.IJO_1165_21).
- [11] Ravani SA, Agrawal GA, Leuva PA, Modi PH, Amin KD. Rise of the phoenix: Mucormycosis in COVID-19 times. Indian journal of ophthalmology. 2021;69(6):1563-68. [https://doi.org/10.4103/ijo.IJO\\_310\\_21](https://doi.org/10.4103/ijo.IJO_310_21).
- [12] Zhang Y, Li WX, Huang KW, Cao ZX, Hao JY. Hospital acquired pneumonia occurring after acute stage of the serious SARS and its treating strategies. Chin J Nosocomiol. 2003;11(13):1081-7.



- [13] Yin CH, Wang C, Tang Z. Clinical analysis of 197 patients with critical severe acute respiratory syndrome in Beijing areas.