

**Computed tomography of paranasal sinuses in assessment of Covid 19 associated rhino-orbital-cerebral mucormycosis with medical and surgical outcome – A single institution retrospective study.**

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**How to citation this article:** Nazia Sultana, S. Venkateswar Rao, R. V Swaroop, D. Manoj Roy, S. Venkatesh., “Computed tomography of paranasal sinuses in assessment of Covid 19 associated rhino-orbital-cerebral mucormycosis with medical and surgical outcome - A single institution retrospective study”, IJMACR-January - 2023, Volume – 6, Issue - 1, P. No. 308 – 315.

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

**Abstract**

Parallel opportunistic infections have emerged as another disease spectrum since the commencement of the COVID-19 pandemic. Among these opportunistic infections, mucormycosis has been a cause for concern because to its fast increase in incidence and dissemination when compared to the pre-COVID-19 period. Cases of post-COVID-19 immune suppression

have been described, combined with the presence of comorbidities, which adds to the disastrous result.

Rhino orbital cerebral mucormycosis in COVID 19 Pandemic has raved up especially in India. Major risk factor was Diabetes for both Covid 19 and mucormycosis independently.

Main purpose of our study is to evaluate the disease in early stages, intra orbital, intracerebral extension, bony

destruction, and medical, surgical outcomes for the prognosis of disease.

**Keywords:** covid-19, rhino – orbital-cerebral mucormycosis, Corticosteroid, COVID-19, diabetes, fungal co infection, mucormycosis,

### **Introduction**

Paranasal sinuses are air filled cavities in skull which makes the skull lighter and add resonance to the voice. Infection (bacterial, fungal, parasitic) causes sinusitis and further more may extent to orbit and brain leading to life threatening complications. Rhino orbital cerebral Mucormycosis (ROCM) is a fulminating and life threatening acute invasive fungal infection affecting patients with risk factors like uncontrolled diabetes mellitus, hematologic malignancies, long term neutropenia, high dose corticosteroid therapy, iron overload, patients undergoing haemodialysis, solid organ transplant, and malnutrition. Following the inhalation of fungal spores that are present in the environment, the fungi colonize the nasal/sinus mucosa and cause infection in neighbouring areas including the orbit, cavernous sinus, and brain.

This disease is characterized by infiltration of mycotic elements into the mucosa, submucosa and blood vessels and further extension into structures like orbit and brain. Occurs in all ages and in both gender when associated with a predisposing risk factor of which the commonest being Diabetes mellitus.

A good treatment outcome depends on early identification of the disease, control of the co morbid illness, aggressive surgical debridement followed by systemic administration of Amphotericin B. Plain radiography of skull has minimal role in diagnosis of sinusitis and its extent, making CT a superior modality.

### **Materials and methods**

A total number of 100 patients referred with history of nasal stuffiness, discharge, headache, cheek and eye swelling with post COVID 19 recovery with symptoms of sinusitis segregated based on age and sex were imaged with GE Revolution Act CT machine(50 slice) in department of radio-diagnosis in Alluri Sitarama Raju Academy of Medical sciences over a period of 12 months(October 2020 to September 2021).It's a retrospective study and on 100 patients fulfilling the selection criteria were studied.

### **Source of data**

Patients referred from outpatient department of tertiary care Centre with past history of COVID 19 pneumonia with sinusitis.

### **Selection criteria**

#### **Inclusion criteria**

Post COVID 19 pneumonia recovered patients with symptoms of sinusitis.

#### **Exclusion criteria**

Not willing to give consent to be a part of study.

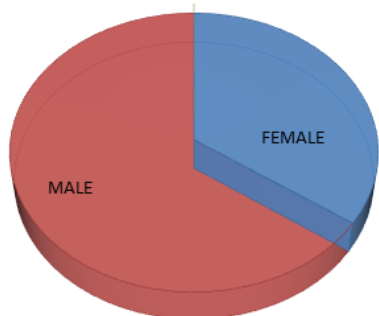
Pregnant females

Symptoms of sinusitis with no past history of COVID 19 pneumonia.

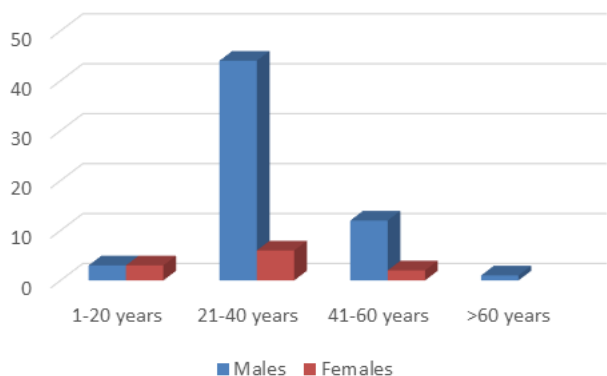
### **Results**

CT evaluation of paranasal sinuses were carried out in 100 patients with symptoms of nasal stuffiness, discharge, cheek and eye swelling in post COVID pneumonia scenario.

Majority of the patients were male i.e. 64 and 36 patients were female, with the male to female ratio 1.7:1. The commonest age group was 32-52years for both males and females.



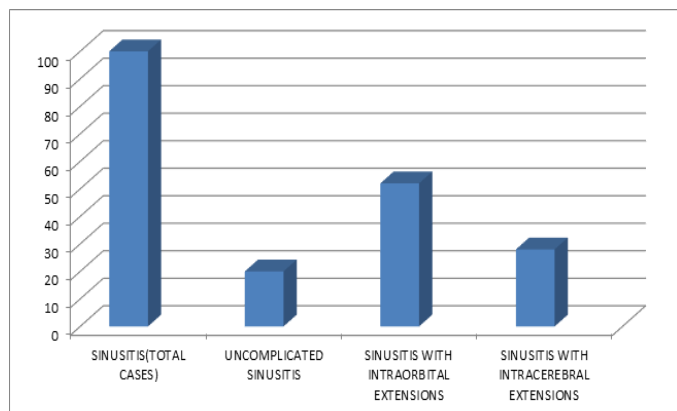
Graph 1: Pie-chart showing male and female distribution



Graph 2: showing age distribution based on the sex

Sinusitis (total cases)	Uncomplicated sinusitis	Sinusitis with intraorbital extensions	Sinusitis with intracerebral extensions
100	20	52	28

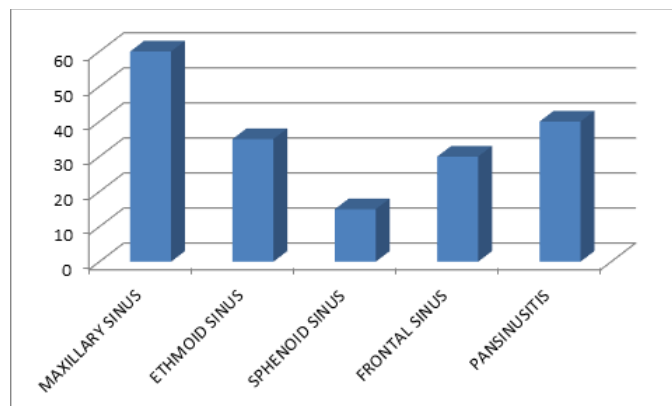
Table 1: showing sinusitis with complications



Graph 3: showing sinusitis with complications

Maxillary sinus	Ethmoid sinus	Sphenoid sinus	Frontal sinus	Pansinusitis
12(60%)	7(35%)	3(15%)	6(30%)	8(40%)

Table 2: showing sinuses involvement in uncomplicated sinusitis-20 CASES (20%)



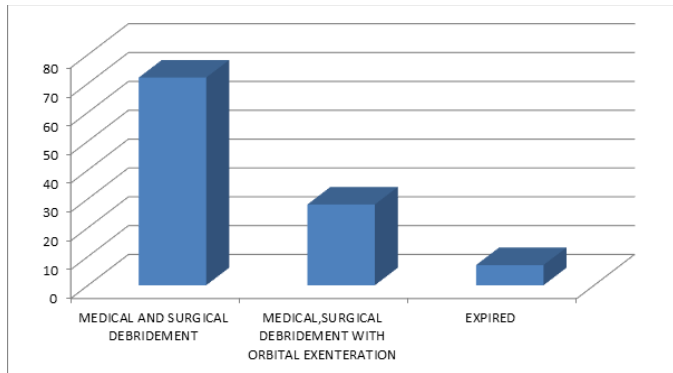
Graph 4: showing percentages of involvement of sinuses in uncomplicated sinusitis



Figure 1: CT PNS axial section showing soft tissue opacification of both maxillary sinus and nasal cavity- B/L maxillary sinusitis with rhinitis.

Medical and surgical debridement	Medical, surgical debridement with orbital exenteration	Expired
37 (72%)	15(28%)	1(7%)

Table 3: showing outcomes of patient diagnosed with sinusitis with intraorbital extension -52 cases



Graph 5: showing outcomes of patient diagnosed with sinusitis with intraorbital extension in percentages.



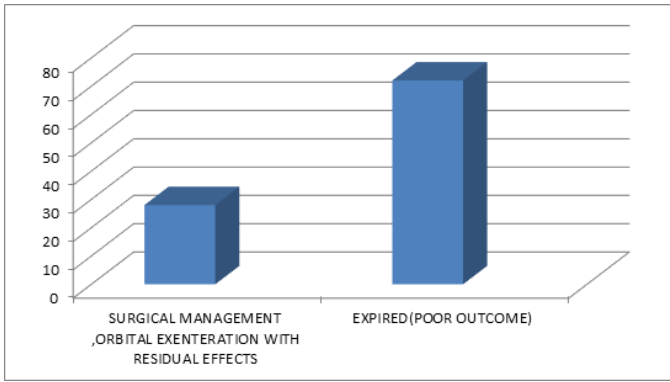
Figure 2: CT PNS axial section showing mucosal thickening of left ethmoid sinus with soft tissue thickening of left preseptal region-Suggestive of orbital extension.



Figure 3& 4: CT PNS coronal reformatted image showing mucosal thickening of left maxillary sinus and left nasal cavity with osteomeatal block on same side, bone thinning and erosions seen along the walls of maxillary sinus, with mild increase in bulk of inferior rectus of left orbit-Left maxillary sinusitis with intra orbital extension.

Surgical management, orbital exenteration with residual effects	Expired (poor outcome)
8(28%)	20(72%)

Table 4: showing outcomes of patient diagnosed with sinusitis with intra cerebral extension-28 cases



Graph 6: showing outcomes of patient diagnosed with sinusitis with intracerebral extension in percentages

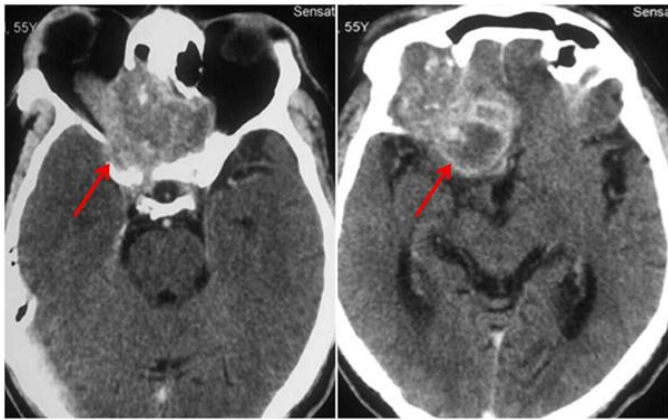


Figure 5: CT PNS axial section with pan sinusitis showing intracranial extension with right frontal abscess.

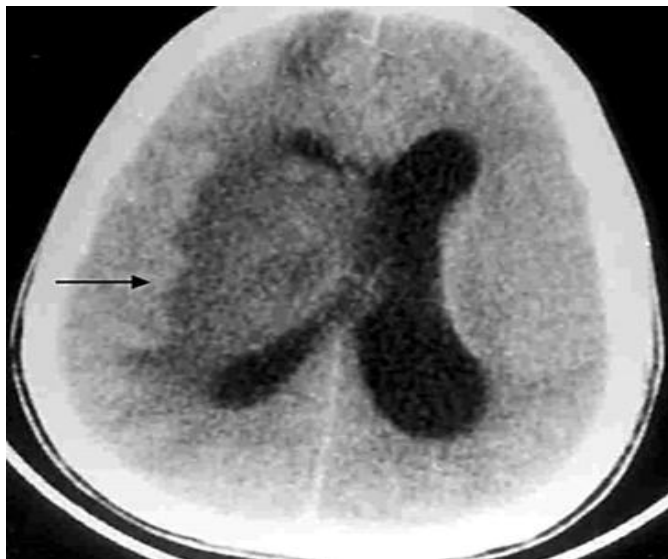


Figure 6: CT PNS and brain axial section showing hypodense area (arrow) in left thalamus and frontal region - suggestive of intracranial extension in early stages of abscess.

CT features	N (%)
Mucosal thickening	100
Osseous erosion	48
Enhancement pattern	
Non enhancing	23
Mild enhancement	70
Heterogeneous	7

Radiological perspective: CT (paranasal sinuses [PNS], orbit) was the primary modality of diagnosis in all the included study after clinical suspicion. Among all the included studies, the most common presentation is involvement of paranasal sinus among which the most common involved sinus is the ethmoid sinus, followed by maxillary sinus. Involvement of orbit is also seen among all the studies primarily involving the extraocular muscle. Occurrence of bony erosion and involvement of apex of the orbit is reported by only few studies. Rarest radiological feature is the involvement of brain commonly radiological presentation is infarction, cavernous sinus involvement, and very rarely internal cranial artery involvement. The most common modality of radiological method is the CT scan followed by MRI. Sharma *et al.* reported the involvement of the ethmoid sinus is the most common involved paranasal sinus (100%) among the included patients.[24] Orbital involvement was seen in 43.47% (10 out of 23, ocular involvement at the time of presentation) followed by intracranial extension (8.69%). Mishra *et al.* reported that all the patients had imaging evidence in the form of CT PNS and MRI brain revealing mucosal thickening of sinuses and adjacent bony erosions.[20] Satish *et al.* in



their retrospective study of 25 patients (COVID-19 associated in 11) predominant presentation was rhino-orbital mucormycosis followed by rhino-orbito-cerebral ( $n = 6$ ) presentation.[19] Only nasal involvement was also seen in their study ( $n = 7$ )

### Conclusion

CT is the modality of choice for evaluation of Para nasal sinus mucormycosis in early stage, helps confirming the extensions, bony destructions and erosions. Hence it is recommended as mandatory workup of all patients with the chief complaint of nasal stuffiness, facial or orbital swelling, proptosis in post COVID recovered patients for better outcome and prognosis.

The management of this uncommon, fast spreading infection needs proper evaluation for early diagnosis, with aggressive surgical debridement, administration of systemic Amphotericin B.

The mainstay of antifungal therapy was amphotericin B. Pooled result showed that total amphotericin B has been given in 93% COVID-19-associated ROCM patients among which liposomal amphotericin B has been given in 90% patients. [15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29] Intraorbital amphotericin B was given by few studies with orbital involvement; [16, 24] however extra advantage has not been established yet. [24] Intravitreal amphotericin B was given in Mucor-associated pan ophthalmitis patients in 54.5% of patients in a single study. [16] Other antifungals used in the management of ROCM patients were voriconazole. Other therapeutic treatments were broad-spectrum antibiotics, [31] tocilizumab, [20] vassopressor, [31] ionotropic agent, and IV dexamethasone. [16, 22] Mechanical debridement was done in 70.9% ROCM patients [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15] and orbital decompression was done in 10% cases in a single

study [20] while exenteration was required in 21.2% patients (10 studies, proportion 0.212, 95% confidence interval: 0.092 – 0.333. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]

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