RESEARCH

CLINICAL STUDY OF SURGE OF MUCORMYCOSIS IN COVID-19 PANDEMIC: A TERTIARY CARE CENTER STUDY

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Abstract

Background: Mucormycosis is a serious and rare fungal infection that mostly affects the immunocompromised. The symptoms depend on the body part affected or the site of infection. By infecting the nose, sinuses, eye, lungs, and brain, it produces a runny nose, one-sided facial swelling and pain, headache, fever, poor vision, bulging or displacement of the eye (proptosis), and tissue death. Various ailments may cause problems with the skin, stomach and intestines, and lungs. The objective of this research is to assess the prevalence, aetiology, treatment, and prognosis of mucormycosis in post-covid patients at our covid-specific tertiary care hospital. **Materials and Methods:** A prospective cross-sectional study was conducted on 50 patients admitted to the GGH/Government Medical College's Nizamabad covid department between May 2021 and August 2021 and diagnosed with mucormycosis. **Result:** The age groups most often affected by mucormycosis ranged from middle-aged to elderly. As a consequence of the ongoing covid pandemic outbreak, few of the affected population, who were mainly diabetic and had a range of hospital presentations, were discovered to have mucormycosis. Covid infection had significant impact on endocrine system as seen by uncontrolled blood glucose levels. The important components of efficient therapy of this condition include early detection, medical care, surgical debridement, proper antifungal medication, and treatment of associated disorders such as diabetes mellitus. **Conclusion:** Mucormycosis is a rapidly progressing sickness that has been demonstrated to be incurable in late presentation and can cause death; however, early detection and therapy may minimise mortality.

INTRODUCTION

Clusters of pneumonia cases with an unknown origin developed in Wuhan, China, in December 2019. Deep sequencing examination of lower respiratory tract materials revealed a new coronavirus, severe acute respiratory syndrome- Coronavirus-2 (SARSCoV- 2), as the causative culprit, and the disease it induced, COVID-19.[1,2] Despite the fact that the novel coronavirus seems to be more transmissible and has a significant mortality rate than SARS-CoV, phylogenetic and clinical parallels between the two coronaviruses have been revealed.[3] The World Health Organization (WHO) declared the COVID-19 outbreak a Public Health Emergency of International Concern on January 30, 2020. On March 11, the illness was declared pandemic.[4] Rhinocerebral mucormycosis is an opportunistic fungal infection caused by fungus of the mucormycetes class that often affects diabetics (in 50% of cases) or those with compromised immune systems. According to one study, the death rate for diabetics with rhinocerebral mucormycosis, the most common kind, is over 40%.[5] Because of the pathogen's increased access to glucose, decreased T-cell response, decreased serum inhibitory activity against Rhizopus at lower pH, and increased expression of some host receptors that facilitate microorganism invasion of human epithelial cells, the infection is more common in diabetic patients. Diabetes and uncontrolled glycemia have been proven to be important predictors of severity and death in people infected with a variety of viruses, including the 2009 pandemic influenza A (H1N1), SARS-CoV, and MERS-CoV. Patients over the age of 65 with several chronic comorbid conditions, such

as diabetes, were at a higher risk of mortality and severe COVID-19. There is little knowledge regarding how glucose is metabolised and how rapidly COVID-19 individuals develop acute diabetic symptoms such ketoacidosis. Diabetes patients infected with SARS-CoV-2 may suffer increased stress and the release of hyperglycemic hormones such as glucocorticoids and catecholamines, resulting in elevated blood sugar levels and altered glucose metabolism. Diabetes was identified as the primary risk factor in 70% of patients in an Indian investigation, the order of systemic infection is in the following - Sinus (39 percent), lungs (24 percent), skin (19 percent), brain (9 percent), GIT (7 percent), disseminated illness (6 percent), and other sites are the most common sites for mucormycosis (6 percent).[6] In terms of clinical manifestations, it may cause necrosis of the paranasal sinuses, mouth, and tongue, which can progress to the orbit before damaging brain regions. Untreated rhinosinus mucormycosis may cause cavernous sinus thrombosis and brain invasion. Therapeutic delays of more than 6 days, signs of cerebral invasion, bilateral involvement, palate invasion, poorly treated chronic diseases, and low GCS at presentation are all bad prognostic indications.

MATERIALS AND METHODS

A prospective cross-sectional research was done on 50 patients hospitalised to GGH/Government Medical College Nizamabad covid department and presented to ENT/MICU and RICU with mucormycosis during admission from May 2021 to August 2021. A full history was taken, as well as otorhinolaryngological, ophthalmic, and neurological evaluations to determine the degree of the condition. Among the initial tests were complete blood counts, blood urea, serum creatinine, serum glucose, urine for ketone bodies, and LFT. Histopathology and KOH preparation of biopsy samples collected from the palate, paranasal sinuses, and/or nasal cavity were used to make the diagnosis. Each of the 50 patients selected for our study had a nasal endoscopy, a CT scan of the paranasal sinuses and orbit, or an MRI of the paranasal sinuses, orbit, and brain. To treat the underlying diabetes, all patients were given human normal insulin injections sixth hourly a day on an RBS schedule. When mucor was diagnosed, all patients began taking systemic posaconazole medication, as well as various therapies to stabilise the underlying metabolic derangement and surgery to debride the necrosed areas caused by mucor. Surgery was chosen as a therapy option based on the severity of the condition. Each patient received two or four split injections of 800 mg posaconazole daily. Based on the kind of operation the patients had, three unique treatment groups were established. Only sino-nasal debridement was performed on patients in treatment group 1. Palatal excision, ocular exenteration, and sinonasal debridement were all combined in the second therapy group. Because all of the patients in treatment group 3 refused surgery, they received just intravenous posaconazole as medical therapy. Adverse effects were decreased by avoiding concomitant nephrotoxic medicines when administering posaconazole and pre-medications. When only sinonasal debridement was required, the majority of patients underwent surgery using the "endoscopic modified denker technique," which allows for thorough debridement of the disease's afflicted regions as well as comprehensive visualisation of the disease's lateral extension, which includes the parapharyngeal space, pterygopalatine fossa, infratemporal fossa, and posterolateral wall of the maxilla. A tiny percentage of patients who had sino nasal debridement and orbital exenteration also had irreversible eye damage. The optimal surgical treatment for patients with palatal erosion who required palatal resection was an open maxillectomy via a Weber-Ferguson incision, followed by palate defect repair using a temporalis muscle flap. Mucosal incisions, soft tissue dissection across the maxilla, and bone incisions to the maxilla were all part of the endoscopic modified denker operation. To prevent stenosis, the nasolacrimal duct was found, preserved, and severely severed at an oblique angle near the end of the therapy. To avoid sickness affecting the pterygopalatine or infratemporal fossae, the rear of the maxillary sinus was completely exposed utilising a four-handed technique.

RESULTS

A total of 50 patients were selected in the study. Males were 37 (74%) & females were 13 (26%).

Table 1: Distribution based on age.

Age group (Years)	Number of patients	Percentage(%)
10-20	0	0
21-30	2	4
31-40	5	10
41-50	17	34
51-60	10	20
61-70	13	26
71-80	3	6

[Table 1] shows that the age group range was between 20 to 80 years and highest number of patients were in the age group of 41-50 years.

Table 2: Distribution of immunosuppressive factors among patients.

Immunosuppressive factors	Number of patients	Percentage (%)
Diabetic	38	76
Non-Diabetic	12	24

[Table 2] shows that Diabetes is the immunosuppressive factor. Maority of the patients were diabetic. Out of which, 12 (24%) were not having diabetes, 38 (76%) had diabetes which was uncontrollable in majority.

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Table 3: Distribution of presenting symptoms among patients.

Symptoms	Number of patients	Percentage(%)
Periorbital swelling	33	66
Facial swelling	27	54
Loss of vision	21	42
Palatal ulcer	9	18
Drooping of yield	10	20
Nasal blockage	4	8
Diplopia	2	4

[Table 3] shows the symptoms presentation. Periorbital oedema and chemosis of eye was observed in 33 patients (66%), 27 patients (54%) had facial swelling, 21 (42%) had vision loss, 9 (18%) had palatal ulcer, drooping of yield was observed in 10 (20%), nasal blockage was observed in 4 (8%) and 2 patients (4%) had diplopia.

Table 4: Distribution of patients according to CORADS grading in HCRT thorax.

CORADS Score	Number of patients	Percentage(%)
CORADS 1	0	0
CORADS 2	8	16
CORADS 3	20	40
CORADS 4	9	18
CORADS 5	9	18
CORADS 6	4	8

[Table 4] shows that all patients underwent HCRT thorax preoperatively and majority of the patients were covid positive.

Table 5: Distribution of patients on basis of RBS values.

Random blood sugar levels (mg/dL)	Number of patients	Percentage (%)
150-200	12	24
201-250	1	2
251-300	5	10
301-350	18	36
351-400	11	22
400 ad above	3	6

Table 6: Distribution of patients on basis of HBA1c level.

HBA1c (%)	Number of patients	Percentage (%)
6-6.5	12	24
6.5-7	2	4
7-7.5	9	18
>7.5	27	54

Table 7: Distribution of patients in different treatment groups.

Treatment	Number of patients	Percentage (%)
Sino nasal debridement only	26	52
Sino nasal debridement with orbital exenteration/palatal resection	19	38
Injection posaconazole only	5	10

[Table 5] shows that the highest percentage of patients was 18 (36%) who had random blood sugar levels of 301-350.
[Table 6] shows that 27 patients (54%) had HBA1c levels of >7.5.
[Table 7] shows that sino nasal debridement was observed in 26 patients (52%).

DISCUSSION

Mucormycosis was the most prevalent diagnosis among individuals with poorly controlled diabetes mellitus and diabetic ketoacidosis. The two underlying illnesses that afflict all people with mucormycosis are impaired neutrophil and phagocyte responsiveness and elevated blood iron. Previous study has demonstrated that diabetic ketoacidosis and increased serum iron availability reduce neutrophil chemotaxic and phagocytic activity. Angio-invasion by fungi was researched extensively in Spellberg B et al.[7] and Hosseini S et al.[8] investigations, and is thought to induce tissue necrosis and spread. According to the Talmi Y et al study,[9] facial discomfort and unilateral facial edoema are two major symptoms of patients, coupled with variable degree fever. Thajeb P et al.[10] described unilateral opthalmoplegia caused by infection or vascular compromise of the orbital contents. The spread of the sickness to the central nervous system, according to Spellberg B et al,[7] signifies the start of confusion and disorientation. Internal carotid artery encasement and cavernous sinus thrombosis, according to Sehgal A et al,[11] impair the central nervous system, resulting in cerebral infarction and the spread of hematogenous disease to organ sites. Early detection of rhinocerebral mucormycosis, as well as rapid and effective treatment, were shown to be crucial for a favourable patient outcome in Kim JG et al,[12] and Spellberg B et al,[7] research. Histological investigation of surgical specimens, according to Lass Florl et al,[13] may confirm the clinical diagnosis when there are right-branching aseptate hyphae, which are regarded to be diagnostic of mucor species, as well as evidence of angio-invasion and tissue necrosis. According to Greenberg R et al,[14] study, fungal cultures yield greater information. According to the Talmi Y et al,[9] study CT scans may be utilised to monitor illness progression even if their link to clinical findings is not always reliable. According to a Spellberg B et al,[7] analysis, the importance of addressing underlying risk factors cannot be overstated. If possible, euglycemia should be restored as soon as possible, and immunosuppressive circumstances should be avoided. According to Reed C et al,[15] the surgical method should be dependent on the patient's clinical status, with quick intervention to achieve proper wound excision of the contaminated zone. Spellberg et al,[7] identified immunosuppression, radiological sign reduction, and clinical symptom reduction as therapy goals.

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According to studies searching for a relationship between mucormycosis and Covid19, SARSCoV2 infection in diabetics may result in higher levels of stress due to increased production of hyperglycemic hormones such as blood glucose levels and abnormal glycemic oscillations. Glucocorticoids are often used to treat Covid19-related illnesses like as SARS, Middle East Respiratory Syndrome (MERS), severe influenza, and community-acquired pneumonia. Hyperglycemia and insulin resistance promote the formation of sticky molecules that mediate tissue inflammation in addition to boosting the production of AGEs, pro-inflammatory cytokines, and oxidative stress. This inflammatory process, according to Sylvia K et al,[16] may be the underlying cause leading to diabetics' greater sensitivity to infections with harmful consequences. The usual age group afflicted in our study was between 40 and 50 years old, with men (74 percent) being more affected than women. This study and that of Balia et al,[17] are equivalent. Diabetes is the most prevalent pre-existing condition and risk factor for nasal cerebral zygomycosis. In keeping with studies by Nezafati et al,[18] and Kolekar et al,[19] which reported that the proportion of underlying diabetes patients was 90% and 80%, respectively, the majority of patients in our study were diabetic. Diabetes patients delayed getting medical assistance during the Covid-19 pandemic owing to family concerns, linked Covid causes, and fear about becoming sick. Patients with zygomycosis symptoms did not get effective treatment in a timely manner due to fear of infection and misunderstanding of the relevance of symptoms, resulting in late-onset difficulties with vision loss. Nasal endoscopy and wound excision were performed on patients who needed it and who followed the appropriate precautions during the COVID-19 pandemic. In all cases, an HRCT thorax was conducted on participants who tested positive for covid 19 by RTPCR. Patients who tested positive were taken care for proper infection control. Patients who had previously tested positive were taken to surgery after their symptoms had eased. Patients who tested positive for COVID 19 or who needed high-risk surgeries had those procedures in a negative-pressure operating room. When doing surgery, surgeons employed powered air purifying respirators (PAPRs) and other personal protective equipment (PPE).

CONCLUSION

Since immunocompromised patients are the most common victims of invasive mucormycosis, they should be considered for early care. Individuals who suspect rhinocerebral mucormycosis should contact a hospital or clinic as soon as feasible. Early discovery is made easier, and survival chances are increased. Given the significant morbidity and mortality associated with invasive rhino-orbito-cerebral fungal infections, an interdisciplinary strategy that is comprehensive and successful is required. This includes aggressive surgical debridement of disease in the paranasal sinuses, orbit, and palate, as well as anti-fungal drug therapy with close monitoring. Early diagnosis and treatment decreases morbidity and increases the probability of survival.

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