

## Oral Pathology

# COVID-19 associated Mucormycosis: The call for dental practitioners



Sanpreet Singh Sachdev  
(B.D.S), Post Graduate  
Department of Oral Pathology and Microbiology  
Government Dental College and Hospital  
Mumbai, Maharashtra.

### Access this article online

Quick Response Code:



Website:  
[clinicaldentistry.ida.org.in](http://clinicaldentistry.ida.org.in)

DOI:10.33882/ClinicalDent.15.27XXX

How to cite this article: Sanpreet Singh Sachdev, Tabita Joy Chettiankandy, Rajesh Gaikwad, Sandesh Suryawanshi, Kalyani Yaduwanshi. COVID-19 associated Mucormycosis: The call for dental practitioners. *Clinical Dentistry* 2021; XV; 19-23. <https://doi.org/10.33882/ClinicalDent.15.27XXX>

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

## Abstract

Mucormycosis is a deadly infection caused by fungi of the order Mucorales in individuals with immunocompromised states due to underlying conditions such as diabetes mellitus, malignancy or neutropenia. The disease was relatively more prevalent in India even before the COVID-19 Pandemic. However, SARS-CoV-2 in itself causes dysregulation of the immune system and the corticosteroids used in the management of hypoxemic COVID-19 also hamper the patient's immunity. Injudicious use of other drugs used for treatment of COVID-19 such as Tocilizumab and Remdesivir could potentially result in bloodstream infections and other immunity-related problems. Furthermore, use of empirical broad-spectrum antibiotics may eliminate physiological protective commensal organism microbes of the body. As a result, there has been a recent rise in cases of Mucormycosis owing to various factors associated with the pandemic. Since the fungi enter primarily through the nose and the initial symptoms are evident in craniofacial region, dental professionals can play a pivotal role in combating infection. The present review aims to equip dental professionals with information pertaining to counter-measures essential to limit the incidence of Mucormycosis in India.

### || Key Words

Dentists; Fungal infection; Glucocorticoids, Prevention; Prophylaxis.

## || Introduction

The COVID-19 pandemic has claimed millions of lives worldwide and India has borne the brunt of the disease as well with an estimated incidence of 24.7 million cases till date<sup>[1]</sup>. Although the number of deaths resulting from the disease was more or less represented by a plateau, the second wave with an exponential rise in the number of deaths is now a cause of grave concern. The disease incites a hyper-inflammatory response which manifests itself in a myriad of ways most common of which is presence of oral enanthemas while other signs and symptoms observed are dysgeusia, ageusia, anosmia, ulcers, bullae and erythematous lesions<sup>[2]</sup>. Thus, it is undeniable that dental professionals can play a vital role in management of the oral lesions in order to ensure a good oral health that would ultimately reflect in ones overall physical and mental well being.

Besides the oral cavity, SARS-CoV-2 causes a generalized dysregulation of immune function by microvascular coagulations, ciliary dysfunction cytokine storm, ARDS/multiorgan failure.<sup>[3]</sup> Furthermore, the present protocols dictate use of Remdesivir and glucocorticoids in management of COVID-19 patients suffering from hypoxic symptoms with an objective to reduce their mortality<sup>[4]</sup>. The glucocorticoids further add to the dysregulation of immune system creating an immunocompromised state which paves way for multiple secondary bacterial and fungal infections. A positive correlation between diabetes mellitus (DM) and severity of COVID-19 has already been established<sup>[5]</sup>. Uncontrolled DM in itself causes impairment of one's immune system and coupled with the effects of SARS-Cov-2 virus, amplifies the severity of the symptoms. In fact, India is rightly termed as the 'diabetes capital' of the world with 77 million estimated cases according to International Diabetes Federation in 2020 and 47% of Indians not being aware of their diabetic status<sup>[6]</sup>. The ketoacidosis and exhaustion of immunity resulting from the deadly combination of diabetes and COVID-19 predisposes the patient to develop secondary bacterial and fungal infections.

### COVID-19 and Mucormycosis:

There has been an alarming rise in reported cases of fungal osteomyelitis occurring in maxillary jaw of the patients with history of COVID-19 infection

recently. A majority of these have found to be cases of Mucormycosis resulting from infection by fungi belonging to the family Mucorales<sup>[7]</sup>. The infection is considered as a 'rare fungus' in western countries that only occurs in patients with immunocompromised state having underlying conditions such as diabetes mellitus, leukemia, neutrophil disorders, history of malignancy, organ transplant, etc. However, in a country such as India with highly prevalent diabetic population, the infection is not so uncommon wherein it contributes to 40% of the global burden of Mucormycosis<sup>[8]</sup>. This is in turn due to the fact that diabetes creates certain conditions favourable for Mucormycosis such as availability of free iron in ketoacidotic state essential for fungal growth, impairment of immunity enabling evasion of host defence by fungi and endothelial damage facilitating angioinvasion by the fungi. The addition of COVID-19 to the equation has only served to add fuel to the fire [Fig 1]. Injudicious

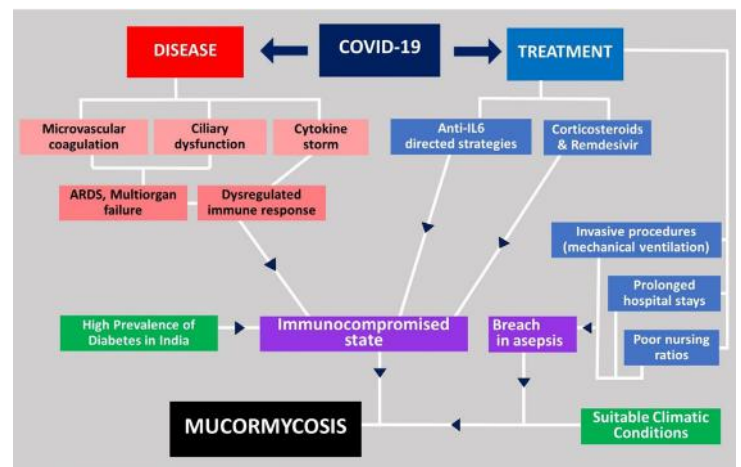


Fig.1: Cascade of events associated with COVID-19 predisposing individuals to develop Mucormycosis infection

use of other drugs used for treatment of COVID-19 such as Tocilizumab and Remdesivir could potentially result in bloodstream infections and other immunity-related problems. Furthermore, use of empirical broad-spectrum antibiotics may eliminate physiological protective commensal organism microbes of the body<sup>[4]</sup>.

The infection has an overwhelming mortality rate ranging from 50-100% depending on the extent of thrombo-invasion and subsequent dissemination of the fungi. However, initial symptoms of the infection are vague and warrant meticulous examination by

clinicians. Diagnosis of the patients may get delayed because attention of majority of healthcare workers is shifted towards combatting the pandemic and also, patients may refuse to report with another infection owing to psychological distress caused by COVID-19 previously. As a result, a lot of cases may go unnoticed or unreported until the disease has reached a disseminated stage. Therefore, early diagnosis of the infection is extremely crucial which can reduce the mortality rate to half [9].

A common inference shared by all the findings is that most of the infections begin by entry through the nose. The most common reason suggested is the fungi present in the ventilators used in hypoxemic patients suffering from COVID-19 that gain access through the nose<sup>10</sup>. Other modes of entry may include traumatic wounds induced during surgery, injection with needle, or through contaminated food. The relatively large size of fungi enables them to be retained in the rhinomaxillary area and thus, subsequently occurring early events of pathogenesis-thrombo-invasion and tissue necrosis are noted in this region. A small percentage of fungi may be inhaled via the respiratory tract into the lungs and cause pulmonary type of infection<sup>[11]</sup>.

**Role of dental professionals:**

Since the fungi primarily enter through the nose and paranasal sinuses, majority of the early signs and symptoms of Mucormycosis are noted in this area. Thus, early cases of infection can be identified only through meticulous examination of the rhinomaxillary area in which Dental practitioners may play a key role. The dentist must be aware of certain ‘red flags’ of Mucormycosis infection involving the craniofacial bones [Fig 2]. Infections beginning at nose may extend to involve the palate through nasopalatine or sphenopalatine arteries subsequently resulting in swelling of alveolar ridge, tooth mobility and associated dental pain [Fig 3]. A patient exhibiting these signs and symptoms along with a background of existing or recent (<6 weeks) COVID-19 infection should be considered as a possible case of Mucormycosis.<sup>12</sup> Furthermore, the organisms may gain entry through the oral cavity by means of extraction sockets or in cases of poor oral hygiene. They may also be introduced into the oral cavity by means of non-sterile wooden spatulas, airtors, or even toothbrushes.<sup>[13,14]</sup> Dental

professionals need to undertake the responsibility of ensuring sterility during dental procedures as well as educating the patients with respect to various protective measures.

Once the infection sets in, fatality is almost inevitable in disseminated forms. Therefore, it would only be rational to limit the incidence by means of prophylactic measures. Adequate prophylaxis and counselling by dentists would definitely help in reducing morbidity and mortality from Mucormycosis, especially in high-risk individuals. The measures essential to prevent establishment of infection are illustrated in Fig 4.

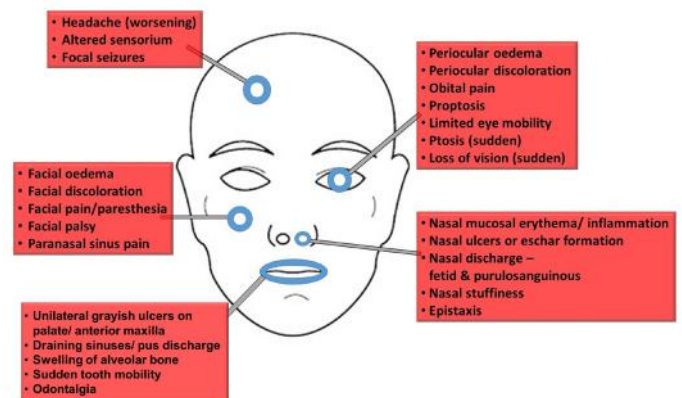


Fig.2: Signs and symptoms of Mucormycosis infection of craniofacial bones: ‘Red flags’ for dental practitioners

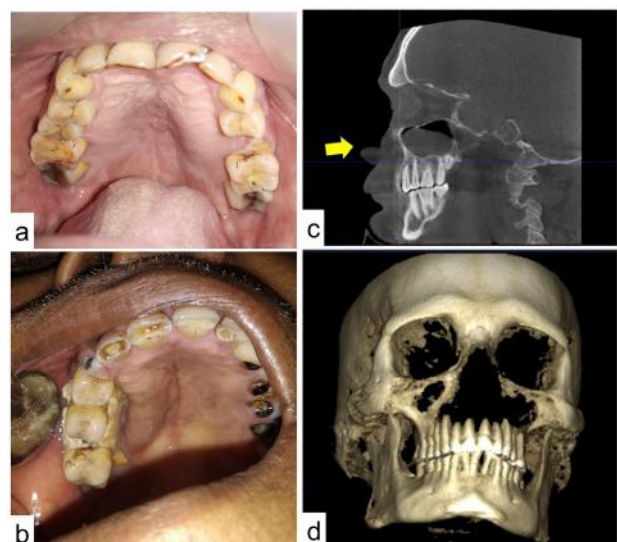


Fig.3: Cases of rhinomaxillary mucormycosis exhibiting a) and b) Expansion of palate associated with osteomyelitis; c) Destruction of nasal septum in Sagittal section of Cone beam computed tomography; d) Extensive destruction of rhinomaxillary bone complex in 3D Reconstruction model of skull

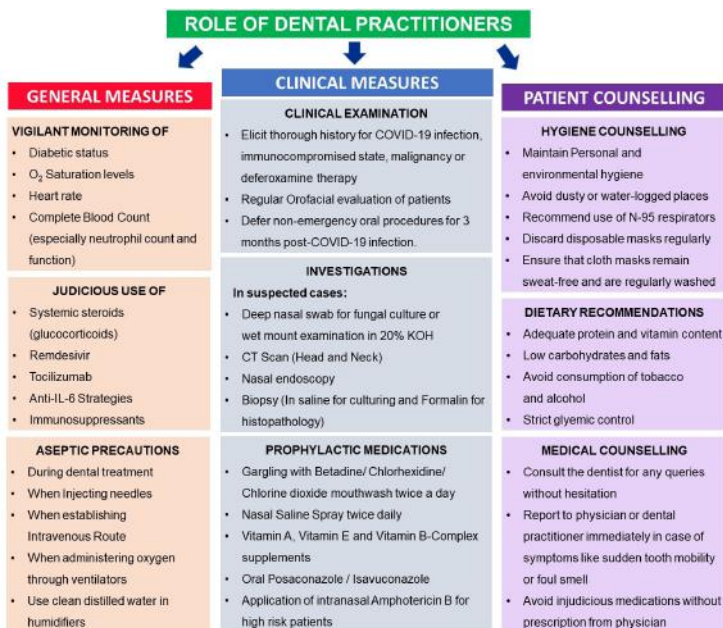


Fig.4: Role of dental practitioners in prevention of Mucormycosis infection in a vulnerable patient.

Even so, a dentist must remember that these prophylactic measures can only serve to limit the fast-spreading disease to a certain extent. Treating the patients with antibiotics and analgesics for orofacial pain/infection must be accompanied with prompt referral to the concerned specialist for opinion.

## || Conclusion

The recent rise in cases of COVID-19 associated Mucormycosis poses a grave threat to the population of our country and healthcare workers need to be equipped with sound knowledge pertaining to the counter-measures essential to limit the incidence of infection. Dental professionals can definitely play a key role in early recognition of these cases subsequently reducing the mortality caused by the dissemination of infection. Active prophylactic measures and counselling by dental professionals would further aid in limiting the incidence of this fast-spreading infection.

## || Conflicts of Interest

There are no conflicts of interest.

## || Source of Support: None

## Co-authors



Tabita Joy Chettiankandy  
M.D.S, Oral Pathology  
Professor and HOD,  
Department of Oral Pathology  
and Microbiology  
Government Dental College  
and Hospital, Mumbai



Rajesh Gaikwad  
M.D.S, Periodontology  
Professor and HOD  
Dept of Periodontology  
Government Dental College  
and Hospital, Mumbai



Sandesh Suryawanshi  
B.D.S, Post Graduate  
Department of Oral Medicine and  
Diagnostic Radiology  
Government Dental College and  
Hospital, Mumbai



Kalyani Yaduwanshi  
B.D.S; M.S  
(Community and Preventive Dentistry)  
Department of Data Analytics  
Oregon State University, Oregon, USA

## || References

1. COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. Available at <https://github.com/CSSEGISandData/COVID-19> [Last accessed 16 May, 2021]
2. Iranmanesh B, Khalili M, Amiri R, Zartab H, Aflatoonian M. Oral manifestations of COVID-19 disease: A review article. *Dermatologic therapy*. 2021 Jan;34(1):e14578. <https://doi.org/10.1111/dth.14578>
3. Nile SH, Nile A, Qiu J, Li L, Jia X, Kai G. COVID-19: Pathogenesis, cytokine storm and therapeutic potential of interferons. *Cytokine & growth factor reviews*. 2020 Jun 1;53:66-70. <https://doi.org/10.1016/j.cytogfr.2020.05.002>
4. Therapeutic Management of Adults With COVID-19. Available at <https://www.covid19treatmentguidelines.nih.gov/therapeutic-management/>
5. Lim S, Bae JH, Kwon HS, et al. COVID-19 and diabetes mellitus: from pathophysiology to clinical management. *Nat Rev Endocrinol* 2021; [17:11–30.]
6. International Diabetes Federation – SEA Members. Available at <https://idf.org/our-network/regions-members/south-east-asia/members/94-india.html> [Last accessed 16 May, 2021]
7. Verma DK, Bali RK. COVID-19 and Mucormycosis of the Craniofacial skeleton: Causal, Contributory or Coincidental?. *J Maxillofac Oral Surg*. 2021;27:1-2.
8. Prakash H, Chakrabarti A. Epidemiology of Mucormycosis in India. *Microorganisms*. 2021 Mar;9(3):523.
9. Mekonnen ZK, Ashraf DC, Jankowski T, Grob SR, Vagefi MR, Kersten RC, Simko JP, Winn BJ. Acute invasive rhino-orbital mucormycosis in a patient with COVID-19-associated acute respiratory distress syndrome. *Ophthalmic plastic and reconstructive surgery*. [2021 Mar;37(2):e40.]
10. Binder U, Maurer E, Lass-Flörl C. Mucormycosis—from the pathogens to the disease. *Clin Microbiol Infect*. 2014;20(Suppl 6):60–6. <https://doi.org/10.1111/1469-0691.12566>
11. Dallalzadeh LO, Ozzello DJ, Liu CY, Kikkawa DO, Korn BS. Secondary infection with rhino-orbital cerebral mucormycosis associated with COVID-19. *Orbit*. [2021 Mar 25:1-4.]
12. John TM, Jacob CN, Kontoyiannis DP. When Uncontrolled Diabetes Mellitus and Severe COVID-19 Converge: The Perfect Storm for Mucormycosis. *Journal of Fungi*. 2021 Apr;7(4):298.
13. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. *Clinical Infectious Diseases*. 2012 Feb 1;54(suppl\_1):S16-22.
14. Abichandani S, Nadiger R. Cross contamination in dentistry: A comprehensive overview. *Journal of Education and Ethics in Dentistry*. 2012 Jan 1;2(1):3.
15. Center for Disease Control and Prevention. Mucormycosis - People at Risk & Prevention. Available at <https://www.cdc.gov/fungal/diseases/mucormycosis/risk-prevention.html> [Last accessed on 17 May 2021]