

UNDERSTANDING MUCORMYCOSIS WITH SPECIAL REFERENCE TO AYURVEDA

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ABSTRACT

COVID-19 is one of the deadly pandemics of this century that had brought human health into a great threat. None of the world's greatest nations or even the world's greatest nations in terms of health care could escape from this pandemic. This pandemic also gave rise to a rare condition which is Mucormycosis, especially in the Indian sub-continent during the second wave of COVID19. The cases of Mucormycosis were very high at that time as India is a Diabetic Capital of the world and Mucormycosis had badly hit India during the second phase of Covid19 in 2021. The modern intervention has a limited scope of treating this strain mostly in the Surgical domain. However, using Ayurvedic intervention Mucormycosis can be well controlled and treated without any Surgical interference and without sacrificing the patient organ. So, an attempt is made to study its *Nidan* (Cause), *Samprapti* (Pathology), *Rupa* (Symptoms) in Ayurvedic prescriptive for modulating effective and Successful treatment protocol. The article presented below is an attempt to explore and deep dive into the basic pathology of Mucormycosis from in Ayurvedic point of view.

Keywords: COVID-19, Mucormycosis, Pandemic, Diabetes, Black fungus, Ayurveda, *Nidan*, *Samprapti*,

INTRODUCTION

Fungal infections are extremely common and some of them are serious and even fatal. Most fungi are saprophytes in the soil and human mycotic infections are mainly opportunistic. The widespread use of modern advances in treatment, such as antibiotics, steroids, and immunosuppressive agents, has reportedly led to an increase in opportunistic fungal infections. Mucor mycosis in association with COVID-19 became apparent in 2020 during the Covid-19 Pandemic. The incidence of the cases increased like a wildfire in some states of India. The first case of this systemic fungal infection also known as Black fungus firstly seen in the state of Gujrat then cases incidence increased in Maharashtra, Andhra Pradesh, Telangana also. It's important to be noted unlike COVID-19 there was not any definite treatment protocol against this infection. So, there is a need for an alternative option that could give suffering patients relief and decrease their hospital stay. The present article is a novel attempt to fill up the gap with an effective and alternative medical option that would work together with the modern system of medicine in hospital wards and could help treat the patient from Mucor mycosis.

Modern Perspective of Mucormycosis: -

Brief History and Incidence Past and Present

The first case of mucormycosis was possibly described by Friedrich Küchenmeister in 1855^[1]. Furbringer first described the disease in the lungs in 1876^[2]. In 1943, its association with poorly controlled diabetes was reported in three cases with severe sinus, brain, and eye involvement^[3]

Mucormycosis is rare, however, it is around 80 times more prevalent in India, estimated cases around 0.14 cases per 1000 population, where its incidence has been rising^[4]. In India, as of 28 June 2021, over 40,845 people have been confirmed to have mucormycosis, and 3,129 dead cases registered. Of these cases, 85.5% (34,940) had a history of being infected with SARS-CoV-2 and 52.69% (21,523) were on steroids, also 64.11% (26,187) had diabetes^[5]

Brief Description of Structure of Fungal Strain

Zygomycosis (commonly referred to as Mucormycosis) is an invasive disease caused by zygomycetes

(Phycomycetes), principally by the species of *Rhizopus*, *Mucor*, and *Absidia*^[6]. They Come under Opportunistic mycoses affecting Immunocompromised individuals or those having defective bodily responses. As described earlier it's one of the rarest fungi affecting humans.

Habitat And Mode of Spread

Habitat^[7]

The group of fungi that cause mucormycosis is present throughout the environment, particularly in soil, and dust particles. And also seen in association with decaying organic matter, such as leaves, compost piles, and animal dung. They are more common in soil than in air

Mode of Spread^[8]

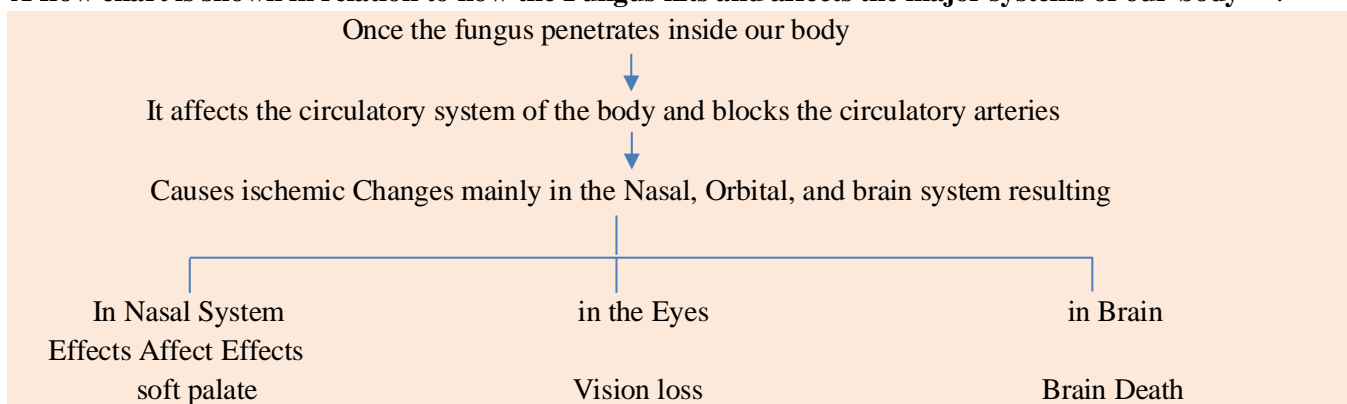
Mucormycosis spreads in the sinuses or the lungs after inhaling fungal spores from the air in the environment. A skin infection also can occur after the fungus enters the skin through a scrape, burn, or another type of skin injury.

Pathogenesis^[9]

Once the spores have penetrated the lungs or subcutaneous tissues, they are met by the first line of defense, mononuclear and polynuclear phagocytes. The phagocytes of the healthy host are able to kill the spores of fungus by generating oxidative metabolites.

These fungi cause infection primarily in patients with diabetes, defects in phagocytic function (e.g., neutropenia or glucocorticoid treatment), or elevated levels of free iron, which supports fungal growth in serum and tissues.

A flow chart is shown in relation to how the Fungus hits and affects the major systems of our body^[10].



Types Of Mucormycosis^[11]

1. Rhinocerebro occipital (sinus and brain) Mucormycosis
2. Pulmonary (lung) Mucormycosis
3. Gastrointestinal Mucormycosis
4. Cutaneous (skin) Mucormycosis
5. Disseminated(widespread) Mucormycosis

Table 1: A short Description of the causes and symptoms of each type of Mucormycosis is described in the table

Type of Mucormycosis	Commonest causes	Symptoms
Rhino Cerebral occipital Mucormycosis	Commonest Cause (Diabetic or Diabetic Ketoacidosis / Renal Transplant Patients)	<ol style="list-style-type: none"> 1. Fever 2. Unilateral facial swelling 3. Headaches 4. Nasal/sinus congestion/pain 5. Partial or Full vision lost 6. Serosanguinous 7. nasal discharge (the fluid that is both serous 8. bloody)
Cutaneous skin Mucormycosis	Direct inoculation of the fungus into disrupted skin burns, injuries	<p>Primary infection</p> <ol style="list-style-type: none"> 1) Acute inflammatory response with pus formation 2) Abscess formation 3) Tissue swelling 4) Necrosis 5) Lesion progresses to black eschars (dry, black necrotic tissue) <p>Secondary Infection (Typically begins as an erythematous, Indurated, and painful cellulitis & then progresses into an ulcer covered with black eschar)</p>
Pulmonary mucormycosis	Hematologic malignancy & neutropenic patients	<ol style="list-style-type: none"> 1. Fever 2. Cough 3. Chest pain 4. Dyspnoea
Gastrointestinal mucormycosis	Less common variant Affected group-neonates	<ol style="list-style-type: none"> 1. Non-specific abdominal pain and distension, 2. Nausea 3. Vomiting 4. Gastrointestinal bleeding may occur
Disseminated Mucormycosis (WIDESPREAD MUCORMYCOSIS)	Seen followed by other types of Mucormycosis	The Infection spreads from the actual site and spreads to another part of the body. Common site brain leads to death

Ayurvedic thinking of Mucormycosis.

The reference to Mucormycosis or disease like Mucormycosis is not mentioned in Ayurveda, so it is an *Anukta vyadhi* [12]. Thus, *Anukta vyadhi* shortly means those disease that is not mentioned in any *Samhitas* or Ayurvedic text. To understand Mucormycosis from in Ayurvedic point of view the concept of *Vyadhi Sankar* has to understand. A combination of diseases is called *Vyadhi sankara* [13]. Sometimes diseases don't get cured and instead gets serious; this prevailing disease serves as etiology for another disease forming a group of diseases affecting the individual leading to serious complications which becomes difficult to cure. Generally, in Mucormycosis patients presents with an inter-related two or more diseases due to defective or low immunity so one disease becomes etiology for other forming a spectrum or mixture of multiple diseases. Hence Mucormycosis is a *Vyadhi sankara* condition

HETUS: -

Hetus play an important role in the occurrence of this disease. Seeing the causes of Mucormycosis we can say both *Bahya* and *Abhyantra Hetus* are involved.

- The *Bahya Hetus* are: - *Dhul* (dust particles), *Bhumi* (Soil), *Klina/put samagri* (decaying organic matter), *Abhighata* (major to minor trauma)
- The *Abhyantra Hetus* are: - The diseases like *Prameha* (Diabetes), *Jwara* (fever), *Arbuda*(cancer), and other *Dhatuksaya janya vyadhi*.

LAKSHANA: -

1. *Mukha sotha* (unilateral facial swelling)
2. *Sirashula*(headache),
3. *Nasa shoola* (nasal pain)
4. *Ardha or purna Dristi hani* (partial or full vision lost)
5. *Kasa*(cough)
6. *Uru shoola* (chest pain)
7. *Pinasa* (Nasal discharge)

SAMPRAPTI

Rogas like Prameha, Jwara, and other Dhatuksaya Janita vyadhi, leads Ojakshaya. This will cause Vatavrudhi causing symptoms like Mukha sotha, Sirashula(headache), Nasa shola, Ardha, or purna dristihani. Now both Ojakshaya and Vatavrudhi leads to Amanirmiti which paves the way for easy entry of

Bajya hetus like Dhul, Bhumi, Klina /puti samagri, Abhighata, etc leading to Amavisha causing Srotasavarudha mainly Pranavahasrotsas causing Swasa, Kasa, Pinasa, Urushoola, Sirashoola, Nasashoola, leading to Avayava nash, and Siramarmaabhighata which causes death if prompt treatment and diagnosis not done.

SAMPRAPTI GHATAK

- ✓ *Dosha-Tridosha (Kapha vata pradhan)*
- ✓ *Dushya- (Rasa, rakta, mamsa, meda, majja)*
- ✓ *Agnidusti –(Mandaagni)*
- ✓ *Srotas- (Pranavaha)*
- ✓ *Srota dusti – (Sanga, vimargagamana)*
- ✓ *Sancharasthaan-(Phuphusa)*
- ✓ *Vyaktasthaan- (Nasa, akshi, sira)*
- ✓ *Prabhava- (if nasa, akshi, Kastasadhya) (if sira Asadhya)*
- ✓ *Svabhava-(Asukari)*
- ✓ *Rogamarga-(Madhyam)*

DIAGNOSIS

✓ **MEDICAL HISTORY** [14]: -

Properly assessing whether an individual is suffering from any of this disorder described below

- Diabetes, especially with diabetic ketoacidosis
- Cancer
- Organ transplant
- Recent covid
- Stem cell transplant
- Neutropenia (low number of white blood cells)
- ✓ **DRUG HISTORY:** - Which medication the patient is taking, duration, course, and doses
 - Un judicious use of Steroids and Immunomodulatory drugs
 - Using unclean Oxygen Humidifier in ICU
 - Too much iron in the body (iron overload or hemochromatosis)

Treatment Options: -

a) Modern Principle of Treatment

Conservative Therapy (Antifungal Medicines)

Surgical management: Surgical debridement to remove all necrotic material

b) *Ayurvedic Chikitsasutra*

Nidan parimarjana: -

- Treatment of Underlying Vyadhis like Prameha chikitsa, Jwara chikitsa,
- Ama Pachan is very important
- Kriminasan chikitsa
- Oja Chikitsa to Prevent Vyadhisankar
- Continuous Rasayan chikitsa to prevent the recurrence and strengthen the immunity

DISCUSSION

The current article describes the Ayurvedic perception of Mucormycosis. It's important to be noted that the cases of Mucormycosis increased many folds in some states during the second wave of COVID 19 period such that those states became the epicenter of Mucormycosis. As mentioned earlier according to data 40,845 positive cases were detected, and 3,129 dead cases were registered (till June 2021). Though the strain is not new as the cases before this period recorded were very less, so medical fraternity has fewer experiences in treating such types of cases. During its initial phases, a very rapid increase of cases was recorded with a significant mortality rate. This strain mainly causes ischemic changes in our nasal, orbital, and Central nervous systems. Epidemiologically it mainly affects diabetic patient or patients with lower immunity status that was the cause of a significant mortality rate.

Modern Science has limited interventions in these complicated diseases; a need of an alternative intervention was necessary. References to such epidemic or pandemic situation, their manifestations, and their management were explained in Ayurvedic Samhitas very vividly. Though the language may be not the same, but the basic interpretation can be said similar. And following a similar approach, this age-old system had played a pivotal role during the entire COVID period.

As stated, earlier Mucormycosis is not mentioned in any ayurvedic text so it's an *Anukta Vyadi*. While explaining *Anukta Vyadhi* Acharya Charaka told that in such types of Vyadhi the Vaidya who is treating such type of cases should assess the *Vitiated Dosha*, *Dushya*, *Prakriti of the patient*, *Agni Status* of the patient, examine the Srotas, formulate the *Samprapti*

Ghatak and initiate the treatment accordingly. As Mucormycosis is a *Vyadhi Sankar avastha* so we should put stress on treating the disease that leads to Mucormycosis. Prameha or Diabetes or diagnosed patient of COVID19 are the root causes of the condition. The *Bahya and Abhyantar Hetus* mentioned earlier are also the important cause. Besides as we know that the root cause of all Vyadhi is *Ama utpatti*. This Ama may lead to Srotavarodha causing Srotas avarodha mainly Pranavaha srotas. Prameha or these hetus may diminished the Ojas which leads to *Ojakshaya* and this *Ojakshaya* leads to *Vatavridhi*. *Vatavridhi*, *Ojakshaya*, and *Srotas avarodha* worsen the condition this led to *Avaya Nasa* leading to *Sira marma Abhighat* and finally, all these phenomena cause the Death of a patient. In order to prevent *Aamotpatti*, *Amapachana* is important, and to prevent *Dhatukshaya* and *Ojakshaya*, *Rasayan* is to be administered. Following this principle, COVID 19 was treated as Mucormycosis follows the same phenomena so this Principle of treatment can be beneficial. However, if we study of Pathogenesis of Mucormycosis in modern point we can see that the strain causes an ischemic change in the brain, eyes, or nasal system. And if the effect in the eyes causes temporary or permanent vision loss, or in the brain, it may lead to the death of a person. And the root cause of this phenomena is Defective or low immunity status. In Modern system

Surgical debridement and Systemic antifungal are tried. But it doesn't give a satisfactory result.

On the other hand, in the Ayurvedic system, *Ojakshaya*, *Amapachana*, and the use of *Rasayan* are given more importance, which can give a very promising result. Hence an attempt is made to study this Complication and postulate ideal natural treatment from an ayurvedic point of view in order to work hand in hand with the Modern system of medicine in a holistic manner.

CONCLUSION

Pandemic always leads to human suffering. Human Society from its existence had witness many deadly Pandemics. COVID 19 is of brutal pandemic affecting the whole world. How a pandemic leads to another

complication, Mucormycosis is a perfect example of it. India had suffered a great loss in the second wave of COVID19 in 2021, the condition become severe when some COVID relief patients or Diabetic patients from some parts of the country started complaining of sudden Partial or Full Vision loss, Nasal /Sinus congestion, pain, Severe fever, Unilateral facial swelling, etc like symptoms and later it was diagnosed as Mucormycosis. Mucormycosis is a rare case but since India has the largest number of Diabetic patients and the second wave of COVID was also prevailing at the time this rare viral infection become Epidemic in some Indian States. The infection was mainly caused by Zygomycosis or mucormycosis which is an opportunistic fungus that invades low immunity patients, so the infection invaded mainly Diabetic Patients, or Covid infected or relieved patients. The modern intervention has a limited scope of treatment and is mostly ineffective. They rely mostly on surgical debridement of the affected organ or use systemic antifungal medications. So, here in this case Ayurvedic intervention can be helpful. As Mucormycosis is not mentioned in any *Samhitas* so it is an *Anukta Vyadi*. Immunity is the key cause of this complication so Rasayan therapy should be administered. Besides as there is *Srotas avarodha* due to *Mandagni Amapachana* with *Agni deepan drugs* is to be used. The present piece of work is a novel attempt to try to study Mucormycosis in Ayurvedic prescriptive and postulate a holistic approach to the complication. However, taking a reference from this article future attempts should be made to formulate treatment protocol for such complications as Mucormycosis and this is one of the *aims* of the article.

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