

**AN INTEGRATIVE APPROACH FOR INTERVENTION OF  
MUCORMYCOSIS ALONG WITH AYURVEDA****Vd. Pooja Shinde<sup>1\*</sup>, Vd. Rekha Jori<sup>2</sup> and Vd. Anil Deshmukh<sup>3</sup>**<sup>1</sup>PG Scholar, Dept. of Shalakya Tantra, SST's Ayurved Medical College, Sangamner.<sup>2</sup>Associate Professor, Dept. of Shalakya Tantra, SST's Ayurved Medical College,  
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A dangerous and uncommon fungal infection is mucormycosis. It was formerly known as zygomycosis. These fungi are found in all parts of the environment, but they are especially prevalent in soil and decomposing organic materials like leaves, compost piles, and rotting wood. In India, the number of cases of mucormycosis is rising quickly. It primarily affects those with lymphoma, diabetes mellitus, diabetic ketoacidosis, HIV/AIDS, and long-term steroid use. Currently, antifungal medication and surgical debridement are used to treat mucormycosis. The treatment cost is also very high and needs a long course of treatment and have lots of side effect associated with it. *Ayurveda* has got cost-effective, potent, and broad spectrum Anti-fungal agents. In this article, preventive management and curative treatment protocol for Mucormycosis are discussed.

**KEYWORDS:** *Ayurveda* medicine, Mucormycosis, Anti-fungal *Ayurveda* medicines.**INTRODUCTION**

Saprophytic fungi are the source of the uncommon opportunistic fulminant fungal infection known as mucormycosis. After aspergillosis and candidiasis, mucormycosis was ranked third among opportunistic deep fungal infections by Brown. It is commonly detected in spoiled food, soil, leftover plants, and the upper respiratory tract of healthy people. When it is linked to risk factors like immunocompromised conditions, most commonly (60–81%) diabetes mellitus, it becomes pathogenic. The other predisposing factors are malignancies like

lymphomas and leukemia's, renal failure, organ transplant, long term immunosuppressant therapy, cirrhosis, burns, protein energy malnutrition and acquired immunodeficiency syndrome. It can manifest as any one of the different clinical forms such as Rhino Orbito-cerebral, Pulmonary, Gastrointestinal, Central nervous system, Cutaneous and Miscellaneous (bones, joints, heart, kidney, mediating).

To treat this fatal infectious disease, Usually Amphotericin-B is used. Impaired renal function is relatively common complication of Amphotericin -B induced nephrotoxicity is manifested as Renal tubular acidosis and electrolyte abnormalities like hypokalemia, Sodium and magnesium wasting. Due to use of high cost anti-fungal medicines, the treatment cost for Mucormycosis is very high.

In this context of prevention and effective management of mucormycosis; Ayurveda has got significant methods. The recommended Ayurvedic management protocol consists of personal hygiene, preventive medications, rasayana drugs, and antifungal medications. The protocol can be effectively managed with an integrative approach or standalone as per the clinical analysis of severity.

## AIMS AND OBJECTIVES

1. Understanding of disease Mucormycosis as per modern science and *Ayurvedic* science.
2. To develop evidence based support for effect of ayurvedic medicine as curative and preventive aspect in Mucormycosis.

## METHODS AND MATERIALS

*Brihatrayi* (*Charaka Samhita*, *Sushruta Samhita*, *Astanga Hridaya*) were selected to collect references of *Pratimarsha Nasya*, *Gandusha*, *Dhupana Karma*, *pranayama*, *rasayan chikitsa*, *jala neti*, *abhyanga*, *siro virechana*, *Raktamokshan* etc. Textbook of Harrison's, Davidsons were selected for the word Mucormycosis and online search was done using the keywords Mucormycosis and Anti-fungal property of herbs.

## Pathophysiology

People get Mucormycosis through contact with fungal spores in the environment by inhalation of fungal spores, ingestion, or through the skin in case of burn or wounds. It leads to Angio invasion, Vessel thrombosis, Tissue necrosis.

**High risk patients**

- COVID recovered
- COVID recovering
- COVID in diabetic patient
- Patients undergoing dialysis
- Patients taking chemotherapy
- Patients who underwent organ transplant taking immunosuppressive drugs

**Types of mucormycosis**

Mucormycosis can be divided into at least 5 types. They are –

1. Rhino-orbital-cerebral disease: It is an infection in the sinuses that can spread to the brain, this form is most common in the people with uncontrolled diabetes and in the people who had a kidney transplant.
2. Pulmonary disease: It is most common type. It is seen in people with cancer or organ transplant.
3. Cutaneous disease: It occurs after the fungi enter the body through a break in the skin (after surgery, burn, or Skin trauma)
4. Gastrointestinal disease: It is more common in young children specially Premature and low birth weight.
5. Disseminated and miscellaneous forms of disease: It occurs when the infection spreads through blood stream to another part of body. The infection most commonly affects the brain, but also can affect 5 other organs such as spleen, trachea, kidney, and peritoneum.

**Diagnosis**

- Sample collection
  - (1) Tissue biopsy- Gold Standard
  - (2) Tissues Swabs- unreliable
- Direct microscopy
  - 1) 10-20% KOH + routine fungal stains
  - 2) Fluorescent brighteners (calcofluor)
- Culture
  - 1) Blood cultures are rarely positive
  - 2) Positive tissue cultures alone are not sufficient to make a diagnosis.
- Molecular analysis

- Bio markers-
  - 1) Beta D- glucan-negative
  - 2) Galactomannan- negative
- Radiology-
  - 3) CT scan- Bony involvement
  - 4) Contrast MRI- soft tissue resolution.

### Treatment

For successful treatment of Mucormycosis, It requires three steps.

1. First initiation of therapy;
2. Rapid reversal of underlying predisposing risk factors;
3. Surgical debridement.

**Prevention:** Good hygiene, Strict sugar control, proper ward protocols and RBS charting.

**Antifungal:** Liposomal Amphotericin B 3-5mg/kg body wt., usually 5 mg/kg body wt. OD

**Isavuconazole-** 200mg BD then once daily

**Posaconazole-** 200mg BD then once daily

**Surgical:** Immediate debridement

**Co- relation of mucormycosis with ayurveda:-** In Ayurveda, we can compare Mucormycosis with Krimija siro roga and Raktaja pratishaya, on the basis of clinical features and etiology of Mucormycosis.

Sr. No.	Nidana	Lakshana
1) Krimija Siro roga	1) Daily indulgence of eating incompatible food items 2) Excessive consumption of Tila, Kshira, Guda as well as eating even during indigestion, eating rotten food etc.	1) Severe pricking pain in headache feeling of something cracking or being eaten up inside the head 2) Blood stained watery discharge from nose mental disturbance 6) Fever, Cough, Loss of body strength 7) Dryness and swelling of face closure of eye lid is also due to lassitude
2) Raktaja pratishaya	3) Dusty atmosphere excessive cold/ hot condition 4) Reversal of seasonal regime 5) Excessive drinking of cold water, exposure of body to dew, smoky atmosphere, suppressing the physiological calls of urine	1) Blood stained discharge from nose coppery discoloration of eye 2) Features of urah kshata 3) Anosmia 4) Presence of small, smooth and white maggot in nasal cavity with characteristics of Krimija siro roga

## DISCUSSION

Role of ayurvedic treatment.

### Personal hygiene

#### Oral hygiene

This includes techniques like brushing your teeth (*Danta-dhavana*), massaging your gums and teeth (*Pratisarana*), cleaning your tongue (*Jivha nirlekhana*), gargling (*Gandoosha* and *Kavala*), etc. that can act as special care on the nose, oral cavity, and eyes—common routes of mucormycosis spread. Neem (*Margosa* or *Azadirachta indica*), fresh stems of *Yastimadhu* (*Glycyrrhiza glabra*), *Arjuna* (*Terminalia arjuna*), *Vata* (*Ficus bengalensis*), *Vijaysara* (*Pterocarpus marsupium*), *Arka* (*Calotropis gigantea*), *Khadira* (*Acacia catechu*), etc can be used for *Danta-dhavana* (brushing the tooth). *Pratisarana* (Massaging the teeth and gums) is done with paste or powder of herbs or by honey/oil along with herbal powder. The commonly used drugs for *Pratisarana* are *Triphala*, *Trikatu* and *Trijata* mixed with honey. Recent researches have proved gum massage is good for dental and oral hygiene. These medicinal plants have a role in the maintenance of oral health and are proven as a potent antibacterial, antifungal, antiviral, and antioxidant in their properties.

#### Kavala and Gandoosha (Oil pulling)

By virtue of their antioxidant qualities, medicated oil and fluid used in kavala and gandusha (Oil pulling) have been shown to shield the oral cavity from infection and inflammation. Studies have demonstrated that the mucosa in the mouth does not function as a semi-permeable barrier that permits the passage of toxins.

#### Pratimarsha nasya

Pratimarsha Nasya is recommended as a daily routine to keep the nasal passages healthy. Oils are frequently recommended for Nasya because of their powerful role, antimicrobial activity, and ability to stop infections from entering the respiratory system. Applying medicated collyrium to the inside of the eyelid is how Anjana is recommended as a daily regimen to preserve eye health.

#### Dhoopana karma

**Dhoopana karma:** The medications prescribed for this condition have antifungal and antimicrobial properties. Guggulu, Neem, Haridra, Kustha, Jatamansi, Sarjarasa, Karanja, Vacha, and so on are frequently used as drugs. Aparajita Dhuma Churna demonstrated that

the flora had a significant decrease in microbes following fumigation, despite the presence of numerous saprophytic fungi and a high concentration of coliforms prior to fumigation. Numerous *Aspergillus* species are considerably more prevalent there, and overall activity against bacteria was more pronounced than that against fungi.

### Rasayana drugs

Administration of Rasayana (Immunomodulators) drugs like *Amalaki*, *Guduchi*, *Vasa*, *Pippali*, *Ashwagandha*, *Haridra*, etc. is beneficial to prevent the associated complications.

Common preparations which act as respiratory immunomodulators are *Chyavanprasha avleha* *Agastya Haritaki Rasayana*. *Naimittika Rasayana* like *Shilajatu* correct the hyperglycaemic episodes and produce their effect by enhancing the *Agni and Ojas* status in the patients, thereby improving metabolic and immune status. If primarily disease is present in the Nasal route then the Panchakarma procedures *Nasya and Dhoom* have beneficial effects. In the case of eye involvement, *Ashchotan /eye* drops can be advised.

### Diabetic patient management

When a patient has diabetes, one of the most important things to worry about is managing their diabetes fairly. Several herbs and herbo-mineral preparations, such as those mentioned in Ayurvedic texts, such as *Trivanga Bhasma*, *Shiva gutika*, *Shilajeet*, *Triphala Churna*, *Nimbapatra*, *Haritaki* (*Terminalia chebula*), *Kahadir* (*Acacia arabica*), *Mangifera indica*, *Eugenia jambolana*, *Allium cepa*, *Allium sativum*, *Aloe vera*, and *Tinospora cordifolia*, can be used to effectively manage diabetes.

### Environmental cleanliness

The way that airborne diseases are spread is through breathing, sneezing, coughing, and other actions that release airborne droplets. *Dhupana Karma* is recommended by Ayurveda for environmental purification. Often used as *Rakshoghna* are *Agaru*, *Sarsapa*, *Guggulu*, *Vacha*, *Neem*, *Haridra*, *Kustha*, *Jatamansi*, *Sarjarasa*, etc. Here, *dhupana karma* is performed using medications that have antimicrobial and antifungal properties.

*Aparajita Dhuma Churna* has been advised in the *Jwara Chikitsa* for fumigation. A study has been conducted and the result of the study shows significantly higher inhabitation of various *Aspergillus* species.

### Antifungal management

According to Ayurveda, Krimihara Chikitsa is helpful in managing and preventing bacteria and fungus. Mucormycosis may be significantly impacted by medications for Pranvaha srotas/Urdhajatrujata roga, Rakta shodhaka, and Raktaprasadaka. Oral medication recommendations for patients based on their Dosha, Bala, and other parameters can be made for drugs such as Panchanimba Churna, Amrita Bhallataka / Rasamanikya, Talasindhura / Talakeshwara Rasa, Mallasindhura / Gandhaka Rasayana, and Mahalaxmi Vilasa Rasa.

*Gandhaka Rasayana* solution in higher concentration showed similar antifungal activity compared to Fluconazole against *Candida albicans* and *Cryptococcus neoformans*. It was more significant against *Trycophytum rubrum* and *Aspergillus Niger* than Fluconazole. Medicinal plants having antifungal properties like *Allium sativum*, *Zingiber officinalis*, *Glycyrrhiza Glabra*, *Curcuma longa*, *Mentha piperita*, *Azadirachta indica* *Withania somnifera*, *Acorus calamus*, *Piper betel*, *Adhatoda vasica*, *Solanum xanthocarpum*, *Aloe Vera*, and *Ocimum sanctum* have antifungal activity.<sup>[10]</sup> Methanolic extracts of *Solanum xanthocarpum* and *Datura metel* inhibited the growth of *Aspergillus fumigatus*, *A. flavus*, and *A. niger*. *Datura metel* showed significant activity against *Aspergillus*. Similarly, *Solanum xanthocarpum* exhibited similar activity.<sup>[11]</sup>

### Prevention

- 1) Take wholesome food
- 2) Wear mask in house
- 3) Wash the mask every day, or use disposable masks
- 4) Maintain Blood Sugar Level.

### Avoid

- Avoid excess of sour, salt and spicy substances.
- Avoid gardening and farm work upto 2-3 months after covid recovery. Fungal spores are richly present in soil
- Avoid fatty, heavy, curd, acidic foods (Such a beans, Palak, Mashroom etc.)

### CONCLUSION

Ayurvedic remedies for prevention and cure include personal hygiene, Rasayana drugs, Krimighna medications, and preventive medications. For the successful treatment of mucormycosis, an exclusive integrative approach combining Ayurveda and strict protocols is



needed. It is advised to conduct additional observational evidence-based research and clinical trials to assess the efficacy of Ayurvedic treatment and medication against mucormycosis.

## REFERENCE

1. Jameson, Fauci, Kasper, Hauser, Longo and Loscalzo, *Textbook of Harrison's principle of internal medicine*, 20: 213.
2. Syeda Neelam Afroze, Rajani Korlepara, Guttikonda Venkateshwar Rao, and Jayakiran Madala *Mucormycosis in a Diabetic Patient: A case report with an insight into its pathophysiology [PMC] [Google Scholar]*
3. Alison Burkett, M.D., Sawanan Saitornuang, B.S., Sixto M. Leal, Jr., M.D., M.B.A. *Microbiology and parasitology. Jameson, Fauci, Kasper, Hauser, Longo and Loscalzo Textbook of Harrison's principle of internal medicine*, 4: 20.
4. Rudra Prasada Giri, Ajith Gangavane, Sucheta Giri, *Neem the Wonder herb – A Short Review. International journal of Trend in Research and Scientific development.* [https://www.researchgate.net/publication/333683177\\_Neem\\_the\\_WonderHerb](https://www.researchgate.net/publication/333683177_Neem_the_WonderHerb)
5. Agnivesha, *Charaka Samhita with Ayurveda Deepika commentary of Chakrapanidatta revised by Charaka and Dridhabala, edited by Vaidya Yadav Ji Tri Vikram Ji Acharya, published by Chaukamba publishers, 2015: 5.*
6. Acharya Vagbhata, *Ashtanga Hridaya elaborated by Vagbhata with Joined commentaries of Ayurveda Rasayana by Hemadri and Sarvanga Sundari by Arunadatta, Harisadasiva Paradakara, Varanasi, Chaukamba publications, Sutrasthana, 2020; 2.*
7. Agnivesha, *Charaka Samhita with Ayurveda Deepika commentary of Chakrapanidatta revised by Charaka and Dridhabala, edited by Vaidya Yadavj Trikamji, published by Chaukambapublishers, reprint, 2015; 7: 159-161.*
8. Cinelaceline, Dr. Sindhu, Dr. Muralidhara M. P *Microbial growth inhibition by Aparajith Dhooma Churna Ancient science of life, 2007; XXXVI (3.) Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3330879/*
9. Vasant C. Patil, *Textbook of Principles and Practices of Panchakarma, Nasya Adhyaya, 4: 534. http://www.palepmrf.com/pdf/Pentaphyte-Literature-2015.pdf*
10. A. K. Meena, Ramanjeet Kour, Brijendra Singh, A. K. Yadav, Uttama Singh, Ayushi Sachan, Bhavana Pal, M. M. Rao *Review on antifungal activities of Ayurvedic Medicinal Plants (researchgate.net). Drug Invention Today, 2009; 2(2): 146-148. (PDF) Review on antifungal activities of Ayurvedic Medicinal Plants (researchgate.net)*
11. Rajesh Dabur, H. Singh, A. K. Chillar, M. Ali G. L. Sharma, *Short report on Antifungal*



- potential of Indian Medicinal Plants. Fitoterapia, 2004; 75: 389-391. Available from: <https://pubmed.ncbi.nlm.nih.gov/15159003/>*
12. Aparna M. *Evaluation of antimicrobial effectiveness of licorice and Triphala mouthwashes against Streptococcus mutans. JAHM [Internet], 2021; 20, 24: 6(3).*
  13. Eskandarinezhad M. *Evaluation of the effects of Triphala on dentin micro-hardness as irrigation solutions. JAHM [Internet], 2021; 15, 24: 3(6). Available from: <http://jahm.co.in/index.php/jahm/article/view/279>*
  14. Reshma M. Saokar, R. S. Sarashetti, Veena Kanthi, Madhav Savkar, C. V. Nagthan, *International Journal of Recent Trends in Science And Technology, ISSN 2277-2812 E-ISSN 2249-8109, 2013; 8, 2: 134-137.*
  15. Meena, A.K., Kaur, R., Singh, B., Yadav, A., Singh, U., Sachan, A., Pal, B., & Rao, M.M. *Review on antifungal activities of Ayurvedic Medicinal Plants, 2010.*
  16. Dabur R, Singh H, Chhillar AK, Ali M, Sharma GL. *Antifungal potential of Indian medicinal plants. Fitoterapia, 2004; 75(3-4): 389-91. doi: 10.1016/j.fitote.2004.01.015. PMID: 15159003.*