

MUCORMYCOSIS IN THE LIGHT OF AYURVEDA

Atri Ghosh^{1*} and Santosh Rahinj²¹PG Scholar, Dr. D.Y. Patil College of Ayurved & Research Centre, Pimpri, Pune.²Associate Professor, Dr. D.Y. Patil College of Ayurved & Research Centre, Pimpri.Article Received on
12 Nov. 2022,Revised on 02 Dec. 2022,
Accepted on 22 Dec. 2022

DOI: 10.20959/wjpr20231-26579

Corresponding Author*Dr. Atri Ghosh**PG Scholar, Dr. D.Y. Patil
College of Ayurved &
Research Centre, Pimpri,
Pune.**ABSTRACT**

Mucormycosis is a serious and rare fungal infection. Previously it is called as Zygomycosis. These fungi live throughout the environment, particularly in soil and in decaying organic matter, such as leaves, compost piles, or rotten wood. Number of cases in Mucormycosis is rapidly increasing in India. It mainly affects people who have HIV/AIDS, Diabetes Mellitus, Diabetic ketoacidosis, Lymphoma and Long term use of steroid. The contemporary treatment for Mucormycosis is surgical debridement, anti-fungal medicine. 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, COVID-19, Anti-fungal *Ayurveda* medicines.

INTRODUCTION

The pandemic coronavirus disease 2019 (COVID-19) remains major problem in worldwide. There are several treatments option to treat and cure Covid-19 except systemic glucocorticoids have been show to improve survival in COVID-19. But excessive use of glucocorticoids can lead to secondary bacterial and fungal infections. However, Mucormycosis is uncommonly suspected or diagnosed. Mucormycosis can manifest in the lungs, but nose and sinuses is also most commonly manifested. From there it goes to eye and leads to visual problems and also spreads to brain, causes headache or seizures. It can occurs in patient who have who have HIV/ AIDS, Diabetes Mellitus, Diabetic ketoacidosis, Lymphoma and Long term use of steroid. Patients who have diabetic ketoacidosis are at high

risk of developing rhino-cerebral Mucormycosis.

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.

As contemporary medicine system involves high cost treatment protocol and it is too expensive for common patients. *Ayurveda* has got cost effective, potent and broad spectrum Anti-fungal agents which can be used as preventive and curative aspect of Mucormycosis.

AIMS AND OBJECTIVES

1. Conceptual study of Mucormycosis as per Ayurveda and modern sciences.
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, Asthanga 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 in COVID 19 and Anti-fungal property of herbs.

Diseases review

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 uncontrolled diabetic patient
- Patients undergoing dialysis due to renal failure

- Diabetic ketoacidosis
- Patients who underwent organ transplant
- Patients who have taken 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-

- 1) CT scan- Bony involvement
- 2) 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 2) feeling of something cracking or being eaten up inside the head 3) Blood stained watery discharge from nose 4) mental disturbance 6) Fever, Cough, Loss of body strength 7) Dryness and swelling of face 8) closure of eye lid is also due to lassitude
2) Raktaja pratishaya	1) Dusty atmosphere 2) excessive cold/ hot condition 3) Reversal of seasonal regime 4) Excessive drinking of cold water, exposure of body to dew, smoky atmosphere, suppressing the physiological calls of urine	1) Blood stained discharge from nose 2) coppery discoloration of eye 3) Features of urah kshata 4) Anosmia 5) Presence of small, smooth and white maggot in nasal cavity with characteristics of Krimija siro roga

DISCUSSION

Role of ayurvedic treatment

Preventive guidelines

1. Keep Personal hygiene
2. Environmental cleanliness
3. Role of diet

4. Use of preventive medications
5. Use of single and compound herbal drugs having antifungal property.
6. Use of *Rasayana* drugs (Respiratory Immuno modulators)
7. Yoga and pranayama for mental health and lungs exercise

Keep of personal hygiene

Mucormycosis infection- a life threatening fungal infection and the common route of Mucormycosis is through nose, oral cavity and eyes etc. With out early diagnosis and treatment, the diseases may spread rapidly. So maintenance of nasal oral hygiene is must. In Ayurveda, for maintaining the hygiene of oral cavity and nasal route, there are detailed description is given in the chapter of DINACARYA. It includes following points:

- a. **Oral hygiene:** Tongue cleaning has a significant rolet on eliminating anaerobic bacteria and prevents the growth of microbes within the oral cavity. Application of Use of *Neem*, *Tulsi* leaves is proven as a potent Antibacterial, Antifungal, Antiviral and Antioxidant in property.^[7]

In the same way use of *Khadira*, *Karanja*, *Nyagrodha* Turmeric, *Lavanga*, *Nagvelli* leaves etc is explained for the maintenance of oral hygiene.

- b. **Kavala:-** According to charak, shukta, tikta, katu, Kasaya Drugs and madhu is used for kavala.
- c. **Pratimarsha nasya:** Commonly *Pratimarsha Nasya* with *Anu Taila* is given, as pouring of oil in the nasal route kills the micro organisms and prevents the entry of micro organism in the respiratory tract. Phalashruti of nasya is drudhata of indriya (Makes the sensory organs strong).
- d. **Anjana:** Anjana is the procedure of applying medicated collyrium to the inner canthus to outer canthus with the help of *Shalakha* or fingertip. Daily use of *Srotanjana* and use of *Rasanjana* is advised in *Ayurvedic* text.
- e. **Abhyanga-** Daily oil massage bestows good vision.
- f. **Pada abhyanga-** Daily foot massage with oil leads to improve vision.
- g. **Jala neti-** It is a cleansing practice .It is performed with the help of neti pot fix with Luke

warm saline water. Regular use of neti helps to re program the body's natural mechanism against respiratory complaint including sore throat, post nasal drip, and immediate relief from respiratory disorders like sinusitis.

- h. Pranayama-** It is the practice of breath regulation. It is a main component of yoga. Pranayama involves different breathing techniques. Like-nadi sodhana, ujjayi, Bhramari, Bastrika. Ujjayi pranayama is very suitable for sinus problem.
- i. Use of Rasayana (Immunomodulators):** As Post Covid complications are common in patients who are undergoing steroid therapy, patients who are Immuno compromised, patients who have uncontrolled Diabetes and chronic respiratory diseases etc. So Use of *Rasayana* drugs are useful for them as it act as an immunomodulators. *Rasayana* drugs like *Amalaki*, *Guduchi*, *Vasa*, *Pippali*, *Ashwagandha*, *Haridra* etc. is beneficial to prevent the associated complications. As *Rasayana* drugs act by repairing the lung parenchyma and by improving the qualitative and quantitative production of T cells.

Common preparations which acts as Respiratory -

Chyavanprasha Leha

Pippali vardhamana rasayana

Agastya haritaki rasayana

Amalaki rasayana

Environmental cleanliness: Air borne diseases are spread through breathing, sneezing, coughing etc. which produces droplets in the air. For purification of environment Ayurveda has advised *Dhupana Karma*. Commonly *Agaru*, *Sarsapa*, *Guggulu*, *Vacha*, *Neem*, *Haridra*, *Kustha*, *Jatamansi*, *Sarjarasa* etc are used as *Rakshoghna*. Here drugs which have Antimicrobial and Antifungal property are used for *dhupana karma*.

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.

Principles of treatment

1. Proper maintenance of *Agni Dipana*: In Ayurveda, root cause for all diseases are mandagni. So proper maintenance of Homeostasis condition of *Agni* is very important. Use of *Laghu Ahara*, *Agni Dipaka* drugs like *chitraka* are advised for preventive aspect of

Post-Covid complications like Mucormycosis.

2. *Krimihara Chikitsa* is useful to prevent the spread of disease. In literature, *chikitsa* sutra of *krimi roga* is a) **prakiti vighatana** *chikitsa* i.e use of the drugs which are the opposite to *krimi*. b) **Krimi Apkarshana**- removal of *krimi* by the help of any instrument. Recently we use the same principle in the surgical management of Mucormycosis. We use the endoscope to see the fungal growth .Endoscope can be correlated with *nadi yantra* which is described in ayurvedic text.
3. *Kapha Pitta Nashaka* and *Vata Avirodhi Chikitsa* is main line of management in Mucormycosis.

Management

1. Use of *Shirovirechana nasya* which has *krimi hara* property is highly effective. *Siro virechana nasya* by *Vidanga*, *Marich*, *Apamarga*, *Sigru bija* are advised in *krimija sira roga*.
2. In case of eye involvement, eye drops prepared from Drugs which are *Chakshushya* in nature like *yasti madhu*, *nimba patra*, *Daruharidra*, *yashada bhashma*, can be used effectively.
3. Use of *pradhamana nasya*- The process of insufflating the powders into nasal cavity by *nadi yantra*/ Tubular instrument is called *Pradhamana nasya*. We can use *Pradhamana nasya* to treat *Krimija sira roga*.
4. *Rakta* is main seat for *Krimi* and *Pupphusa* (lungs) are originated from *Rakta*, so *Raktaprasadaka* medicines are beneficial.
5. For *krimija sira roga*, *vyosadi nasya* is advised.*vyosadi nasya* is prepared by *Trikatu*, *karanja bija* and *sigru bija* mixed with goat's urine.
6. *Apamargadi taila* is also beneficial for *krimi roga*. This *taila* is prepared by *Apamarga bija*, *Trikatu*, *Haridra*, *Ksavaka*, *Hingu*, *Vidanga*, *Gomutra*, *Tila taila*.
7. *Pancha valkal Kasaya* has significant effect against fungal infections
8. *Triphala* extract shows anti microbial property against *Lactobacilli* and *C.albicans*.
9. *Gandhak rasayan* solution in higher concentration showed similar anti fungal activity compared to *Fluconazole* against *Candida albicans*, *Cryptococcus neoformans* but it is more significant against *Trycophytum rubrum* and *Aspergillus niger* than *Fluconazole*.
10. *Jaluka* (leech)- It sucks blood and reduce inflammation and occlusions in the blood vessel. *Bdellins* and *Eglins* are the anti inflammatory agents who subside local inflammatory process, *Hirudin* and *calin* are the anti coagulant agents that effectively

inhibit coagulation.

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.)

Research evidence on antifungal preparations: A review article has been available on medicinal plants having antifungal activities – It is concluded that the drugs like *Neem*, *Vasa*, *Vacha*, *Yastimadhu*, *Haridra* etc. are having forceful antimicrobial and antifungal property. Another study has been conducted on 14 Indian plants, selected based on their use in respiratory and other disorders in traditional systems of medicine, were analyzed for their potential activity against fungi. Results shows that *Datura metel* and *Solanum xanthocarpum* had significant activity against fungal infections.

Cumin and fennel essential oils could be used as substitutes to conventional antifungal drugs for treating edentulous patients with oral candidiasis.

CONCLUSION

According to above Discussion, Mucormycosis can be treated as curative purpose and preventive purpose by the help of Ayurveda.so, Ayurvedic management should be implemented by Ayush Dept. either alone or along with conventional medicine.

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
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. Swati Chainani et.al. Antimicrobial activity of Triphala on Lactobacilli and Candida

- albicans: An in vitro study. 2015 Journal of Orofacial Science, 2015; 104-107. Available from: https://www.jofs.in/temp/JOrofacSci72104-5609324_153453.pdf*
15. Reshma M. Saokar, R. S. Sarashetti, VeenaKanthi, MadhavSavkar, C. V. Nagthan. Screening of antibacterial and antifungal activity of Gandhaka rasayana an ayurvedic formulation. *International Journal of Recent Trends in Science and Technology*, 2013; 8(2): 134-137. Available from: https://www.researchgate.net/publication/307138130_Screening_of_antibacterial_and_antifungal_activity_of_Gandhaka_rasayan_a_an_ayurvedic_formulation [accessed May 24 2021].
16. Patil V, Rodd M. Ayurvedic treatment protocol for COVID 19. *JAHM [Internet]*, 2021; 3, 24: 9(1). Available from: <http://jahm.co.in/index.php/jahm/article/view/419>