

Mucormycosis in COVID-19 Patients: An Emerging Threat

Mamta Choudhary^{1}, Dr. L. Gopichandran²*

¹Tutor, College of Nursing, AIIMS New Delhi,

²Associate Professor, College of Nursing, AIIMS New Delhi

**Corresponding Author*

Email Id: mamta24.c@gmail.com

ABSTRACT

Worldwide, cases of Mucormycosis commonly known as Black Fungus has been reported increasingly in Covid-19 patients, mainly in developing countries such as India. This Infection is commonly seen in patients suffering from immune and metabolic disorder. The major factors that favor Mucormycosis to spread in people who are suffering with COVID-19 is an ideal condition of low oxygen, Diabetes, steroids intake, high iron (serum ferritin) level and decreased phagocytic activity and White blood cells (WBC) secondary to immunosuppression (SARS-COV-2 medications, steroids and background comorbidities, along with prolonged hospitalization. This paper highlights pathogenesis of Mucormycosis in Covid-19 patients and focus on important literature enlightening diagnosis and management of Mucormycosis.

Key Words: *Mucormycosis, Covid-19, Black Fungus.*

INTRODUCTION

Corona-virus disease (Covid-19) which is caused by SARS-COV-2, is linked with vast range of complications, fungal and bacterial infections [1,2]. Worldwide, cases of Mucormycosis commonly known as Black Fungus have been reported increasingly in Covid-19 patients, mainly in developing countries such as India. The term Mucormycosis was coined by R.D Baker, which is also known as zygomycosis. It is a pernicious fungal infection caused by members of mucrales and zygomycotic species. Rotten matter or soils are the main cause through which the common saprobe (Mucormycosis) originates. This Infection is commonly seen in patients suffering from immune and metabolic disorder [2].

Patients suffering from predisposing conditions such as Acidosis, uncontrolled Diabetes Mellitus, Leukemia, AIDS, severe malnourishment, cytotoxic therapy, severe burns and immune suppression from corticosteroid use are more prone to this infection [3,4,5,6]. It has also been spotted in patients with longstanding renal failure, liver problem, dialysis patient and

those on deferoxamine therapy [6,7]. However, there is no known linkage of the infection with age, race or sex [6].

The major factors that favors Mucormycosis to spread in people who are suffering with COVID-19 is an ideal condition of low oxygen, Diabetes, steroids intake, high iron (serum ferritin) level and decreased phagocytic activity and White blood cells (WBC) secondary to immunosuppression (SARS-COV-2 medications, steroids and background comorbidities, along with prolonged hospitalization [8]. The dispersion of Mucormycosis is diversified from 0.005-1.7 million population globally, whereas its dispersion in India is nearly 80 times higher (0.14 per 1000) in comparison with other developed countries in a recent estimate of year 2019-2020, making it a major health related concern[8,9,10,11].

SEARCH STRATEGY

This evidence-based review focused on integrative reading and review of published articles on Mucormycosis from the Medline, CINAHL, Social Sciences Citation Index, PsychINFO, a hand search

through selected journals published since 2000, and from references lists. The suitability of the articles for inclusion was determined by the following screening questions: (1) Is the article published in authenticated peer reviewed journal? Articles published in journals that lacked the authentication of legitimate scholarly journals such as peer review, editing, editorial boards, editorial offices, and other editorial standards were excluded from the review [12]. (2) Is the focus of paper relevant to the review topic?

PATHOGENESIS

Almost 60% of Mucormycosis cases are caused by the most common type known as *Rhizopus Oryzal* which also includes 90% of the Rhino-Orbital-Cerebral (ROCM) form [13]. However, the leading risk factor linked with Mucormycosis worldwide is diabetes mellitus with 46% of mortality rate overall [14]. It is believed that diabetic and immunosuppressed patients have insufficient normal phagocytic activity on their mucosal and oral surfaces. This allows dispersion of fungus, which doesn't occur in people with normal phagocytic activity and thus the fungus reach to the blood vessel [6].

The acidotic, hyperglycemic atmosphere existing in patients with ketoacidotic diabetes mellitus specifically favors the growth of *Rhizopus* [3,6]. The main area where the fungus attacks are the paranasal sinuses, skin, lungs and GI tract [3,5,6]. Basic symptoms, signs and pathological findings are relatable in mucormycosis un concerned of Etiology [3]. These fungus have an affection towards arterial invasion, which causes comprehensive emboli and necrosis of surrounding tissues [13,14,15]. In the course of the infection vein and lymphatic invasion occur lately [15]. There are five forms of the disease Rhino-cerebral, GI tract, Pulmonary, cutaneous, and disseminated Mucormycosis.

However, Rhino-Orbital-Cerebral Mucormycosis (ROCM) and Pulmonary Mucormycosis are most common forms reported in COVID-19 patients. Common rote of transmission of Mucor-mycosis are by inhaling the fungal spores that are present in the air of our surroundings or environment mainly in hospitals. It cannot spread from person to person. The most commonly presented symptoms include swelling on one side of the face, swelling in the eyes and nose, blurry or double vision, blackish discoloration on the nose, headache, Nasal and sinuses congestion, fever, cough, difficulty in breathing, worsening of respiratory system also common in COVID-19 [13,14,15].

In ROCM, the progression of infection in stage one starts from the nose causing nasal blockage and congestion, pain in nose, along with swelling and numbness on the face. The infection reaches the bone cavity around the eye in second stage causing headache, orbital pain, blurred vision, partial blindness or even complete blindness. The infection progresses to jaw of the mouth in third stage and is manifested as tingling, chilling or burning sensation in whole of the body and fever. In some of the cases infection spreads to brain causing unconsciousness and black spots on the skin near the nose or eye. Pulmonary Mucormycosis commonly presents as fever, cough, shortness of breath, hemoptysis and varying degree of chest pain [13,14].

DIAGNOSIS

The diagnosis of Mucormycosis is a challenging task; however, it is of paramount importance for initiating early treatment. The diagnosis of mucormycosis should be based on high index of suspicion, and should focus on recognition of host factors and early identification of clinical manifestations. The hallmark of mucormycosis is tissue necrosis, however similar presentation can be seen in other

fungal infection is such as aspergillus or fusarium, thus the differential diagnosis is of much importance. The “red flags” symptoms for mucormycosis to be considered include sinus pain, periorbital swelling, ulcers of the palate, orbital apex syndrome, cranial nerve palsy, diplopia, and proptosis. MRI PNS (paranasal sinus) with brain contrast and CT scan are used as radiological diagnostic test for ROCM and pulmonary mucormycosis respectively. Tissue culture, direct microscopy, CT angiography and histopathological examination can be helpful in differential diagnosis [16,17].

TREATMENT

Once diagnosis has been established, quick and effective action needs to be taken for the treatment of mucormycosis to reduce its effects. Treatment for mucormycosis can be either medical or surgical or combination of both depending on the seriousness of the infection and patient's health condition. Treatment may include Antifungal medication for a long period of time so that disease can be under control. Liposomal Amphotericin B in initial dose of 5mg/kg body weight (10 mg/kg bodyweight in case of CNS involvement) is the treatment of choice. Maintaining normal blood glucose level in diabetic patients, judicious use of steroids and immunosuppressive drugs, and initiating medical therapy during crucial time is utmost recommended [7,17].

Nursing Management of Mucormycosis [18]

- 1) Promptly identify on-risk patient and consult physician to initiate diagnostic evaluation.
- 2) Check the patient twice daily for ahead mentioned signs and symptoms: persistent fever, headache and nasal discharge which could be brownish or blood tinged, pain and loss of sensation on face, discoloration of skin of face or localized facial buffiness, loosening of teeth, discoloration of bridge of nose or ulceration of palate, eye swelling or redness, double vision, loss of vision, eye pain, drooping eyelid.
- 3) Patient should be made aware of these symptoms and should be instructed to report back to healthcare worker if he suffers from any of these symptoms.
- 4) Instruct patient to avoid exposure to decaying or soiled matter.
- 5) Closely monitor diabetic patient for glycemic control. Ensure regular blood glucose monitoring for diabetic patients screen non-diabetic patients for stress hyperglycemia and undiagnosed diabetes.
- 6) Closely monitor patients on steroid therapy for duration of steroid therapy and adherence to prescribed doses.
- 7) Identify environmental risk factors such as construction site within or near hospital, dampness on the walls of patient care areas, reason of dampness such as leaking water supply and insufficient air filtration. Contact maintenance department of hospital to rectify these risk factors as soon as possible.
- 8) Ensure activation of infection control committee condition. Patient's linen should be dry and changed daily or whenever needed. The humidifier bottle should be cleaned and sterile. water must be change daily. Ensure that patient ventilator circuits and rebreathing mask and tubings are changed as per protocol.
- 9) Emphasize measures to prevent post covid-19 infection such as to wear mask whenever going out, cover yourself with full sleeves t-shirts and full trousers, gloves and shoes while doing gardening or handling soil or going near dusty construction sites, sanitize your hands thoroughly, maintain personal hygiene, if any comorbidities are there continue prescribed medication, keep your blood sugar level under control to prevent from black fungus.

CONCLUSION

Covid-19 is associated with a wide range of bacterial and fungal infection due to low body's immune system. The excessive use of steroids medication as a treatment covid-19 may lead to rise of various fungal infections. Mucormycosis also known as black fungus is a deadly fungus which is seen among covid-19 patients across hospitals in India. It is a disease which has a close link to diabetes and conditions that compromise the immune system. Thus, it is recommended to maintain and boost up the immune system, decrease the overuse of steroids and control the uncontrolled diabetes.

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