RISK OF MUCORMYCOSIS IN COVID-19 PATIENTS: A REVIEW

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ABSTRACT

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India is trying to maintain stability in the current circumstances; another immediate threat has developed in the shape of coronavirus diseaseassociated mucormycosis. Mucormycosis is uncommon but lethal disease, caused by a group of molds known as mucormycetes. If not treated properly, an infection might be fatal. The most ordinary risk factor is diabetes mellitus, followed by hematological malignancies. Patients with postpulmonary tuberculosis and persistent renal diseases are further probable to extend mucormycosis in India. Trauma increases the risk of cutaneous mucormycosis. Despite a rise in illness awareness among treating physicians, disease-related morbidity and mortality remain high, as patients seek medical attention late in the disease process and medication is expensive. Despite the fact that it has been present

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since the beginning of the pandemic, the cause of this fungal infection remains unknown. In this review we aimed to summarize about mucormycosis and its epidemiology, pathogen, and treatment options in context to COVID-19.

KEYWORDS: Mucormycosis, COVID-19, Pathogen, Cutaneous.

INTRODUCTION

The worldwide spread of the pandemic because of novel COVID (CoV) called COVID-19 or SARS-CoV-2 causing serious intense respiratory condition (SARS) is presenting extraordinary repercussion on human wellbeing and economy. A virus is an irresistible specialist (non-cell parasite) with hereditary material; single (ss) or double strandard (ds) or nonenveloped/ wrapped (lipoproteins) included by a protein capsid (1). Severe acute respiratory syndrome corona virus-2 contagion can trigger important and persistent lymphopenia and increase the risk of mounting opportunistic contaminations. Mucormycosis is an uncommon but dangerous persistent fungus that occurs primarily in immunocompromised patients; especially those diagnose with unrestrained diabetes mellitus or hematologic problems, and formerly fit persons with Mucorales-infected open wounds (1-3). Patients infected with the SARS CoV-2 may develop COVID-19, which is related through considerable and chronic lymphopenia and damages the immune system, particularly in the large amount severe instances (4-6). According to several writers, an inflammatory storm is more common in those who have a considerable

decline in lymphocyte number and an augment in neutrophil count COVID-19 and co-infections in individuals with severe COVID-19 (4). As COVID-19's second gesture spreads across India, patients of COVID-19-implicated "black fungus" are increasing in a small area. Despite the fact that Aspergillus and Candida are more prevalent fungi, this one is particularly harmful because it affects the sinuses and the brain, and it occurs in immuno-compromised people and/or those who are taking medications (source: Economic Times). As per CDC, mucormycosis patients had an overall mortality rate of 54 percent. This rate, yet, fluctuates depends on the primary medical stipulations, the type of fungus, and the position of the diseased body. Since the outbreak of the pandemic, the black fungus have has forced numerous COVID-free patients reverse in intensive care units. As per previous studies, virus causes excruciating pain and has caused 20-30% of those infected to go blind. Vision loss happens when an infection spreads below the retina and squeezing the optic nerve (7).

BLACK FUNGUS AND ITS AFFECT

Mucormycosis is a deadly however relatively infrequent fungal illness causes by the mucormycetes,

a fungus. This fungus is able to be establish in a diversity of locations, although they are most commonly originate in earth and decaying organic debris such as leaves, compost piles, and putrid wood (8). Mucormycosis is a fungus that primarily affects those who have health problems or who use medications that weaken the immune system. The sinuses and lungs are the most affected by inhaling fungus spores from the air. A scar, a blaze, or any sort of skin damage could potentially be the reason. (9).

DIFFERENT TYPE OF MUCORMYCOSIS

Rhizopus species and Mucor species are the most common forms that cause mucormycosis. Rhino cerebral Mucormycosis (infection of the nose and brain) is a type of illness that is able to travel to the brain. This kind of mucormycosis is bound to impact diabetics and individuals who have a kidney relocate. Pneumonic (lung) mucormycosis is the much incessant type of mucormycosis in malignant growth patients and individuals who have had an organ or stem cell transplant. Gastrointestinal mucormycosis is further normal in kids than in grown-ups, particularly in untimely children and babies with a low birth weight short of what one month old who have gotten antiinfection agents, careful treatment or medications that lessen the body protection from microbes and illnesses. In persons who do not have a damaged immune system, this is the most prevalent kind of mucormycosis. While India works to maintain stability in the current circumstances, another immediate threat has developed in the shape of coronavirus disease-associated mucormycosis.

MUCORMYCOSIS PATHOGEN

Mucorales are saprophytic fungi that can be discovered in decomposing organic materials and soil samples (10,11). In a study of Mucorales in Indian soils, pathogenic species such as Rhizopus, Lichtheimia, Cunninghamella, Rhizomucor, and Apophysomyces were isolated. Mucorales taxonomy is still changing; 11 genera and 27 species have been identified as mucormycosis causal agents. In India and around the world, Mucormycosis is caused by the fungus named, Rhizopus arrhizus.. However, the range of chemicals that cause this condition in India is quite broad. Rhizopus microsporus and Rhizopus homothallicus have been linked to an increase in mucormycosis patients in recent investigations (12).

CAUSES OF THE DISEASE AND RISK FACTORS

The most frequent underlying condition is diabetes mellitus (Fig.1), which is followed by haematological malignancies and organ transplants. Mucormycosis in immunocompetent hosts, on the other hand, represents ERA'S JOURNAL OF MEDICAL RESEARCH, VOL.8 NO.2 a serious hazard to the Indian population. North India (67 percent) has a higher prevalence of diabetes mellitus as a risk factor than South India, according to Prakash et al (22 percent) (13). In a study of acute myeloid leukemia patients in South India, the prevalence of verified mucormycosis cases was found to be 0.9 percent (14). Mucormycosis was found to be prevalent in 0.56-1.52 percent of kidney transplant recipients in South India, according to many investigations. After trauma, burns, and nosocomial infections at the surgery or injection site, the majority of patients develop cutaneous mucormycosis. Patients with post-intramuscular injections in the gluteal region developed cutaneous mucormycosis, according to Chander et al. from North India (15). In nosocomial mucormycosis, contaminated intramuscular injections and surgeries, sticky adhesives, and endobronchial tubes were sources of infection. Chronic kidney disease (CKD), steroid therapy, pulmonary TB, and chronic obstructive pulmonary disease are also risk factors for mucormycosis in India (COPD) (13,16).



Fig. 1. Pathway, How Covid-19 Takes Part in Mucormycosis.

EPIDEMOLOGY OF MUCORMYCOSIS IN INDIA

After the starting of COVID-19 second wave in India, cases of mucormycosis is gradually increasing. During the years 1990–1999, Chakrabarti et al. found a growing trend of mucormycosis from a single center, with an annual incidence of 12.9 cases per year (17). During the years 2000–2004, there were 35.6 cases per year (18), and 50 cases per year during the years 2006–2007 (17). Overall, the number of cases grew from 25 per year (1990–2007) to 89 per year (2013–2015) (19). In 2021, cases of mucormycosis gradually increasing in various states of India for example Maharashtra (6389 cases), Madhya Pradesh (764 cases), Gujarat (5486 cases) and Uttar Pradesh (800 cases) till 8th of June, are most affected states (Fig. 2).



Fig.2: Most Affected States in India From Mucormycosis (Assessed On 8th June 2021)

SYMPTOMS OF MUCORMYCOSIS BY MEANS OF COVID-19

Mucormycosis develops a few days after an individual recuperates from the COVID-19 disease. After the patient has fully recovered from COVID-19, and this fungal illness begins in the sinuses and advances to the eyes in 2-4 days. The symptoms of mucormycosis vary depending on area of the infection originates into the body, according to the CDC. Cough, nose or sinus irritation, fever, and rapidly increasing black lesions on the nasal overpass or upper center of the mouth are all indications of rhinocerebral mucormycosis, which causes one-sided facial edema (sinus and brain). Fever, cough, chest pain, with dumpiness of breath are symptoms of pulmonary mucormycosis (20).

TREATMENT OPTIONS

Early treatment, surgical debridement of infected tissue, antifungal therapy, and care of the fundamental ailment are all used to treat mucormycosis. Amphotericin (AmB) is the first-line treatment, followed by posaconazole and isavuconazole. (21). The main limitations in addressing mucormycosis in India are a treatment protocol gap and patients' financial restraints, which prevent them from affording liposomal therapy. Isavuconazole, a new anti-Mucorales medication, exhibited efficacy comparable to AmB (22), but it was only recently introduced in the Indian market, so its efficacy has yet to be determined. The danger of this fungus can be reduced by limiting the use of steroids for an extended period of time. The therapy includes antifungal medication and, if possible, surgery to remove the infected area. In COVID patients who are elderly, immunocompromised, have cancer, or are diabetic, steroids and immunosuppressive medications should be

administered with precaution throughout treatment (23,24). The Indian government has released five guidelines to help COVID-19 patients avoid black fungal infection: In general cleanliness, glucose management, cautious utilization of steroids, new water in humidifiers for oxygen patients, and brief treatment of oral ulcers (25,26).

CONCLUSION

Although the actual pervasiveness of mucormycosis in India is mysterious, it is thought to be significantly greater than in developed countries. A large population of vulnerable hosts, particularly diabetics, as well as a disregard for regular health check-ups by In. Uncontrolled diabetes and COVID-19 infection are common risk factor for mucormycosis. Increased mucormycosis in India appears to be the result of an unholy trifecta of diabetes (high hereditary incidence), corticosteroid overuse and COVID-19 (cytokine storm, lymphopenia, endothelial damage). In CDCs point of view, symptoms of the mucormycosis vary depending on wherever the infection starts within the body. To limit the risk of deadly mucormycosis, patients with COVID-19 should maintain optimum hyperglycemia and use only judiciously evidencebased corticosteroids. India requires, the wide range of agents highlights the need to develop routine clinical laboratory facilities in order to discover unusual mucorales linked to mucormycosis. In order to ascertain the actual prevalence of mucormycosis in various at-risk populations in India, populationbased studies are required, which will aid in drawing stakeholder attention to early identification and management of the disease.

CONFLICT OF INTEREST: No

ABBREVIATIONS

COVID-19- Coronavirus Disease-2019

CDC- Centre for disease control and prevention

COPD- Chronic obstructive pulmonary disease

AmB-AmphotericinB

SARS-CoV-2- Severe acute respiratory syndrome corona virus-2

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