Review Article

ERA'S JOURNAL OF MEDICAL RESEARCH

VOL.8 NO.2

DOI:10.24041/ejmr2021.38

COVID-19 AND MUCORMYCOSIS: A SHORT REPORT FROM INDIA

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Received on : 23-11-2020
Accepted on : 28-12-2021

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ABSTRACT

Many complications and symptoms were documented on COVID-19 patients in the second-phase of the COVID-19 outbreak in India. Patients with COVID-19 are already of increased risk of pulmonary embolism (PE), acute cardiac injury (ACI), arrhythmias, and a variety of additional consequences such as altered mental status and proptosis. Mucormycosis, a fungal infection produced by a type of moulds known as mucormycetes, was discovered in a COVID-19 patient. It is a very rare and serious fungal infection (Black Fungus). Mucormycosis, one of the most rapidly spreading infections in COVID-19 patients, has been recorded in 11,717 cases in India. Molds dwell in the environment and primarily affect people who have a weak immune system. Inhaling pathogenic organisms from the air usually causes it to harm the sinuses and lungs. COVID-19 individuals have immunosuppressive with significant drop in CD4+T and CD8+T cells, in addition to alveoli damage and severe pulmonary inflammation. As a result, severely ill-patients, particularly those sent in the intensive-care-unit (ICU) and requiring mechanical ventilation, or those with extended hospital stays 40 to 50 days were more susceptible to mucormycosis. Further, it is crucial to find out that COVID-19 patients especially the ones who are severely ill resulting in weaker immune system can further develop a fungal infection during the middle and or latter stages of COVID-19.

KEYWORDS: Mucormycosis, COVID-19, Infection, India.

INTRODUCTION

Mucormycosis is a fungal infection that is extremely rare. Mucor mould is found in the soil, crops or in the decomposing vegetables and fruits. It can be present in healthy people's noses and mucous. It damages the sinus, brain, and lung, and it could be severe in diabetic or very weak patients, including cancer patients or HIV/AIDS patients. India has so far reported 11,717 cases (on May 25, 2021) of mucormycosis one of the most rapidly spreading infection in COVID-19 patients. Therefore, taking serious note of this increasing numbers in COVID-19 patients the Indian Central Government has emphasized upon providing the Amphotericin-B, a critical medicine in the treatment of this raging mucormycosis, to all of the states that have been severely affected. Gujarat had reported mucormycosis cases with 2,859 cases, followed by Maharashtra with 2,770 cases, Andhra Pradesh with 910 cases, Madhya Pradesh with 720 cases, and Rajasthan with 700 cases. According to the most recent government data, cases of mucormycosis were reported in other states such as Karnataka with 500 cases, Haryana with 250 cases, New Delhi with 197, Punjab with 95 cases, Chhattisgarh with 87 cases, Bihar with 56 cases, Tamil Nadu with 40 cases, Kerala with 36 cases, Jharkhand with 27 cases, Odisha with 15 cases, Goa with 12 cases, and Chandigarh with 8 cases. As a notifiable disease, it has been declared an epidemic by the Indian Central Government, with 11 states having already declared it an epidemic.

It is common to find this fungal infection in COVID-19 patients who have been on steroids for an extended period of time, who have been hospitalized for an extended period of time, who have been on oxygen or ventilator support, and who have been exposed to poor hospital hygiene, as well as in COVID-19 patients who are already taking treatments for other illnesses like diabetes. Without prompt treatment, a fungal infection

can progress to a life-threatening stage. Clearly, COVID-19 medications, particularly steroids which deplete the body's energy and impair the ability to fight against infection. Even diabetic and non-diabetic Covid-19 people experience elevated blood glucose levels as a result of this medication.

In 1885, Paltauf (1) described Zygomycosis (also known as phycomycosis), which was later renamed Mucormycosis by Baker, an American pathologist, in 1957 (2). Cunninghamella, Absidia, and Rhizopus are mould fungi that cause angio-invasive infections in the body. They are members of the Mucorales belonging to the Class of Zygomycetes and found in Rhizopus, Rhizomucor, and Cunninghamella (3). *Human mucormycosis is caused by Rhizopus oryzae, which accounts for around 60% including all cases and accounting for 90% in terms of a Rhino-orbital-cerebral (ROCM) variant (4).* When fungus spores are inhaled, they contaminate the environment. Overall, mucormycosis occurrence ranged between 0.005-1.7 per million people. The occurrence of mucormycosis is 80 times as high as 0.14 per 1000 in the years 2019–2020 (5-7). There are currently no data from randomized clinical trials on specific treatments that improve patient infection (8).

The use of corticosteroids for longer period of time may be associated with the number of infections including mucormycosis and aspergillosis (9). A few articles have also observed mucormycosis as a result of a brief course (5 to14 days) therapy of steroid, which is particularly common in diabetic individuals (10). Even a 12-hour delay in diagnosing mucormycosis in a COVID patient results in death, and 50 percent of mucormycosis cases have only been discovered in post-mortem autopsy series (11). As a result, mucormycosis cases in COVID patients are of great public health concern, as the death rate is rather high, and cerebral mucormycosis can increase the rate of death to as high as 90% (12). It is critical to understand the relationship between mucormycosis and COVID-19 aggregation, as well as it predicts future performance in connection to comorbidities and the medications administered to COVID-19 patients, as well as the characteristics of the patients, were studied in relation to their result.

INCIDENCE AND PREVALENCE

Previously, mucormycosis prevalence in the overall population was estimated at 0.005-1.07 per million (13). Mucormycosis incidence in India is 0.14/1000 diabetes individuals, which is 80 times greater than anywhere in the globe (14) and more in the overall population based on modelling (15). Given India's over 62 million diabetes individuals, mucormycosis is a major public health issue (14). Diabetes represented the underlying condition in 54–76% of mucormycosis cases, with 8–22% having diabetic ketoacidosis (16). Moreover, diabetes prevalence in mucormycosis patients differed by Indian region (17). Numerous reports reported from India, where corticosteroids were used inappropriately to control the disease, resulting in greater death rates and exacerbating the pandemic scenario (18).

POSSIBLE CAUSES OF THE INCREASE IN MUCORMYCOSIS CASES

COVID-19 patients with severe infection are given steroids (19). Long-term steroid use may contribute to mucormycosis, or black fungus. Steroids can also boost blood sugar levels by increasing insulin resistance and lowering insulin activity (20). Furthermore, due to the current COVID-19 outbreak, many patients are self-medicating at parent's house without adequate understanding. It has long been an issue in Pakistan and India (21,22). A lack of information among the general public may also contribute to self-medicating using steroid even when they are not needed.

Moreover, some scientists claim that black fungus likes uncontrolled diabetes. Because India is the world's largest diabetic capital, and many individuals refuse to take their treatments, diabetes control is poor (23). Experts believe that the climate in South Asia may be contributing to the spread of fungus (24). The growth in mucormycosis outbreaks in Pakistan and India may be linked to climate (25). Commercial air, non - sterilized hospital instruments, and frequent usage of same mask and tubes are thought to produce mucormycosis (26). Unsanitary conditions, poverty, and low living standards in Pakistan and India may have contributed to the fungus outbreak (27).

Since the outbreak of the pandemic, many supplements, including as vitamin B12, vitamin D (28), or zinc, have been used to help boost immunity. Zinc is known to positively influence fungal pathogenesis and growth. Zinc may play a function in controlling the synthesis of infection-related proteins (29). Mammalian hosts normally limit their bodies' unbound zinc or other metals to prevent fungus growth. During COVID-19 pandemic, unintentional usage of zinc increased body zinc levels, which may have led to the growth in mucormycosis cases (30).

MUCORMYCOSIS AND COVID-19 IMPLICATIONS

For nearly a year and a half, India and Pakistan have been grappling with COVID-19 and its ramifications as developing countries. As a result, their healthcare

systems have been badly harmed and are on the verge of collapse (31-32). Having an impact on the battle against various infectious diseases. The arrival of black fungus in the midst of such crises has put a lot of burden on healthcare professionals and the government. Demand for amphotericin B, the only effective therapy for black fungus, has risen recently due to the increase in mucormycosis patients. Demand for antifungal therapy has increased, leading in an illegal market for drugs that were already expensive (33,34).

As India continues to battle a crippling second wave of COVID-19, eye, nose, and throat experts predict seeing more mucormycosis patients in the coming weeks. Stress has hastened the dwindling resources and manpower essential for effective management (31). Due to the ongoing COVID-19, putting precautions in place to successfully treat an outbreak such as mucormycosis would be difficult. Although Pakistan has fewer cases of mucormycosis than India, the entire healthcare system has weaknesses that might lead to rising in cases (35). Because Pakistan lacks a comprehensive national healthcare system, illness surveillance is restricted, making it impossible to assess the extent of the impact of a disease or illness. In addition, most Pakistani laboratories lack fungal diagnostic capability, infection control programs, antimicrobial stewardship, and essential antifungal drugs (36).

RECOMMENDATIONS AND ACTION PLAN

In order to stop the spread of mucormycosis, intervention is needed both in India and Pakistan. The Indian Council of Medical Research recently set rules for optimal treated, diagnosis, and management (37). Diabetes, long-term steroid use, extended intensive care unit care, post-transplant patients, and voriconazole medication all are major risk factor for mucormycosis (38). As a result, these patients must take caution and vigilance while following all public health guidelines for COVID-19 and mucormycosis. Handling soil, moss or manure with gloves and wearing shoes, long pants, long sleeves, and gloves. Ensuring personal hygiene by vigorously cleaning when bathing. Antifungals are used to treat black fungus, generally intravenously. Amphotericin B is a frequently used anti-pandemic drug in India. Antifungal therapy may be required for 6 weeks. Dead or contaminated tissue is often surgically removed (40).

Drug abuse is a major issue in many countries, especially India and Pakistan. Thus, targeting politicians, doctors, and the public at large is empirically addressed. Restrictions on pharmacist and other health care providers dispensing medications may help reduce patients' self-medication. Prohibiting the sale and usage of medications like steroids, antibiotics and antifungals without a prescription could help. To identify uncontrolled and unneeded drug usage, a system of regular evaluation, monitoring, and auditing by physicians could help. To effectively manage mucormycosis, health resources such as antibiotic, which is now inadequate in certain states of India (21), must be deployed as cases increase globally. An extensive national mucormycosis database will help track and map the disease's spread.

CONCLUSION

Mucormycosis is a serious condition that can be fatal if not treated promptly, especially in people with COVID-19, diabetes, or immunosuppression. The disease can be lethal if not treated quickly, especially in those with COVID-19, diabetes, or immunosuppression. Symptoms that require quick attention include: toothache; loss of teeth; pain in jaw; confused or the double eyesight; feverish; skin imitating eschar; chest pain, hemoptysis, aggravation of respiratory symptoms People who have diabetes with COVID-19 patients should regularly monitor their blood sugar levels to avoid mucormycosis infection. Cleaning and sterilizing humidifiers and vents can help avoid mucormycosis.

ABBREVIATION

ICU	Intensive Care Unit
COVID-19	Coronavirus disease-19

CONFLICT OF INTEREST

No conflict of interest

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How to cite this article:

Fatima G, Parvez S, Raza AM, Fedacko J, Hadi NR. COVID-19 And Mucormycosis: A Short Report From India. Era J. Med. Res. 2021; 8(2): 204-208.