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## **Mucomycoses identified using the COVID-19 health impacts with mucomycoses consider the COVID-19: A multi-center study**

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**Abstract**---Objective: The study's participants had mucormycosis associated with the coronavirusdisease 2019 (COVID-19), and the researchers sought to describe their clinicalcharacteristics, risk factors, and ultimate findings (CAM). Study Design: A Multi-center Study. Place and Duration: NTH AND HMC hospital Peshawar. Duration July 2019 to July 2020. Methods: Overall, this research included 180 cases in which both sexes showed signs of mucormycosis during the pandemic coronavirus outbreak of 2016. Patients were between theages of 22 and 80. After obtaining written permission from each patient, demographic information such as age, sex, BMI, and illness duration was gathered. Patients were hospitalized in COVID-19's emergency ward and underwent RT-PCR and MRIs. Mucormycosis was examined for its comorbidities, symptoms, and etiology. End-of-study death rates, hospitalizations, and admissions to

intensive care units were all tallied up. To analyze the complete dataset, the SPSS 20.0 version was used. Results There were 130 men and 50 females in the study population (26.6 percent ). The patients had a mean age of 52.44 years and a mean BMI of 27.74 kg/m<sup>2</sup>. In this research, 54 (62.2 percent) patients had COVID-19, and 35 (38.9 percent) had coronavirus. Mucormycosis had an average length of 20.08 days, with a standard deviation of 7.11 days. Eye pain/swelling of the eyes, nasal stiffness, headache, and blurred vision were the most prevalent symptoms of the condition. There were 133 (65 percent) instances of rhino-orbital mucormycosis. 120 (65.5%) of the patients were from metropolitan regions, and 78 (40.0%) of them were literate, according to the data. More than 71% of patients had diabetes, making it the most frequent comorbidity in this group (76.5 percent ). There were 108 (64.4 percent) instances where the most likely cause was excessive use of steroids during a pandemic. After the trial, the mortality rate was 30.2%. Conclusion: According to this research, mucormycosis is a possible complication of COVID-19 among individuals at high risk. According to a recent study, steroid overdoses were the most prevalent cause of poor diabetes mellitus. To diagnose CAM in its earliest stages, clinicians must be educated and monitor regularly for diabetic management.

**Keywords**---identified, mucomycoses, COVID-19, health impacts.

## Introduction

As a result of SARS-CoV-2, other opportunistic bacterial and fungal infections, including COVID-19, have been linked to the 2019 coronavirus epidemic. It has been shown that COVID-19 patients had *Aspergillus niger* and *Candida albicans* co-infections<sup>1</sup>. Mucormycosis has been reported often by patients with COVID-19, particularly in India, during the last several years<sup>2</sup>. For people suffering from a condition known as COVID-19, the right mix of low oxygen, elevated blood sugar, elevated iron (raised ferritin), and decreased WBC acid activity may assist germination in these patients (metabolic acidosis, diabetic ketoacidosis, [DKA]) Paltauf first documented phycomycosis or zygomycosis in 1880. The word Mucormycosis was developed by a U.S. pathologist in 1956 to characterize a severe illness caused by *Rhizopus*<sup>3</sup>.

People with impaired immune systems are more likely to get mucormycosis, a rare but potentially lethal condition. Mucormycosis is an angio-invading sickness caused by a mold fungus in the class Zygomycetes. *Rhizopus Oryzae* strains are responsible for 62.2 percent of human mucormycosis and 85 percent of rhino-ocular brain mucositis (ROCM). Inhalation of fungal spores may transmit illness<sup>4</sup>. According to the most current 2019–2020 forecasts, the prevalence of mucormycosis in India is over 82 times greater (0.12 per 1000) than in industrialized nations worldwide, ranging from 0.005 to 1.6 per million people<sup>5</sup>. As a result, India has the most cases of mucormycosis worldwide. Despite this, India has the second-highest population of diabetics in the world<sup>6</sup>. The most common causes of death linked with mucormycosis in Europe and the United

States are hematological malignancies and organ transplantation<sup>7</sup>. Diabetes mellitus is the leading cause of mucormycosis worldwide because of its high death rate. Indeed, the occurrence of D.M. constituted a risk factor all on its own. A comprehensive 2019 meta-analysis of 951 cases of seldom occurring mucormycosis found that *Rhizopus* (46 percent) was the most often isolated species<sup>8</sup>. Even a brief history of corticosteroids, particularly in people with diabetes mellitus, is associated with mucormycosis, according to a recent study (DM<sup>9</sup>. Prednisone beyond 600 mg in a single dosage raises the risk of mucormycosis in patients with impaired immune systems.

Months previous to this one, Patients with D.M. have developed mucormycosis following a brief (5–14 day) course of steroid therapy<sup>10</sup>. The European Confederation of Medical Mycology found that 46 percent of patients diagnosed with mucormycosis got corticosteroids within a month of diagnosis<sup>11</sup>. According to these findings, the widespread use of corticosteroids during the COVID-19 pandemic has been questioned. In India, patients with the COVID-19 virus are more likely to get mucormycosis. There are several documented instances of this happening all across the world. Grey literature contains anecdotal material, which may be found in print and electronic media. Due to the high mortality toll associated with mucormycosis, these findings are significant for public health. The death rate jumps to 85% when mucormycosis is present in the brain<sup>12</sup>. There has been an alarming increase in the number of instances of mucormycosis, and even a 12-hour delay might be fatal, as half of the cases had previously only been discovered by post-mortem autopsy series<sup>13</sup>. COVID-19 mucormycosis individuals are the primary focus of this study, which aims to discover their clinical aspects and the contributing circumstances that led to their condition (CAM) <sup>14</sup>.

### **Material and Methods**

From July 2019 to July 2020, 180 patients were studied at NTH and hmc hospital Peshawar for this observational/descriptive study. Each patient's written consent was obtained before any demographic data, such as age, gender, BMI, and length of illness, were collected. In this study, we did not include patients who were not sick, were younger than 22 years old, had undiscovered fungal infections, or had not provided written consent. Those who received therapy ranged in age from 22 to 80. Active COVID-19 cases were those individuals admitted to the hospital after a laboratory test for SARS-CoV-2 was performed in the emergency department (through rapid antigen or nucleic acid amplification) (by rapid antigen or nucleic acid amplification test). Patients who had been infected with COVID-19 in the previous three months but were harmful to SARS-CoV-2 when presented at the E.R. were included in this group. To meet established criteria for post-acute COVID-19 syndrome, a three-month time limit was imposed on the experiment. MM and recent or acute COVID-19 disease must be present for a patient to be categorized as having mucormycosis.

Medical histories and risk factors; COVID-19 steroid use information; COVID-19 steroid use before COVID-19 symptoms; arrival vitals; diagnostic evaluations (radiological and microbiological); E.D. pharmacological therapy; final surgical disposition are all included in the data set. Public information on the presentation, severity and treatment of COVID-19 has been gathered. Documentation. The

mortality rates, hospitalizations, and admissions to critical care units after the trial were all totaled. Analyzing categorical variables relied on frequencies and percentages. The standard deviation of the mean was used in the data analysis. The SPSS 20.0 version was used to analyze the whole dataset.

## Results

Moreover, three-quarters (70%) of the patients were men, while the remaining 30% were women (25.9 percent). The average patient age was 51.44 years, and the average body mass index was kg/m<sup>2</sup>. This investigation included 110 (60 percent) patients with COVID-19 and 36 (40%). It took an average of 19.077.11 days for mucormycosis to spread across the body. Nasal congestion, a headache, and blurred vision were among the most prevalent signs of the condition. 70 (60.1 percent) of the patients were from metropolitan regions, and 60 (42.2 percent) were literate. (see table 1 below)

Table 1: A list of enrolled patients' basic information.

Variables	Frequency (n=180)	Percentage
Age Mean (years)	51.42±12.64	
BMI Mean (kg/m <sup>2</sup> )	28.44±8.72	
Gender		
Male	130	65
Female	50	35
Mean duration of mucormycosis (days)	18.08±7.11	100%
Symptoms		
Eye pain/swollen	50	25.8
nasal stuffiness	46	26.6
headache	44	25.4
blur vision	40	24.2
Residency		
Urban	120	64.7
Rural	60	32.3
Literacy		
Yes	90	48.2
No	90	52.8

The most frequent comorbidity was diabetes mellitus, followed by hypertension and coronary artery disease in 140 (70.2%). There were 40 (30.1 percent) instances where the most likely cause was excessive use of steroids during a pandemic. There were 130 instances (65 percent) where rhino-orbital mucormycosis was discovered. (see table 2)

Table 2: Comorbidities and causes of disease among the patients

Variables	Frequency (180)	Percentage
Comorbidities		
Diabetes mellitus	140	70.1
hypertension	24	15.2

Coronary artery diseases	16	14.7
Use of Steroids		
Yes	120	65.6
No	60	34.4
Rhino-orbital		
Yes	126	70
No	54	30

According to our findings, 38 (42.2 percent) of the patients recovered, 20 (22.2 percent) were subsequently brought to the intensive care unit, and a 32 percent mortality rate resulted (35.6 percent). Table 3 displays (as an example)

Table 3: Case-by-case comparison of illness outcomes

Variables	Frequency (180)	Percentage
Outcomes		
Recovered	80	40.2
ICU Admission	40	21.8
Mortality	60	39.0
Total	180	100%

## Discussion

Mucormycosis is rare in healthy persons but may occur in those with weakened immune systems. DKA may be caused by organ transplantation, chronic neutropenia, immunosuppressive and corticosteroid medication, iron overload, cefuroxime and desferrioxamine therapy, voriconazole prophylaxis for burn transplant patients, AIDS, intravenous drug misuse, malnutrition, and open sores. This research included 180 people<sup>15</sup>. Elderly patients dominated (70.2 percent). Patients' mean ages were 51.44 and 26.41 kg/m<sup>2</sup>. Moreover, half of the patients were 31 to 65-year-old men, confirming earlier findings. Two-thirds of both studies' participants are men ages 31 to 65, matching Chander's 82 million-person survey.

Oestrogen may have cut women's infection risk since it protects against systemic fungal infection<sup>16</sup>. One person (60.1%) was an outlier. COVID-19 and 35 (39.9%) were discovered in corona virus<sup>17</sup>. Mucormycosis spread during 18.087.11 days. Most Eye pain, swollen eyelids, a stuffy nose, and hazy vision are frequent symptoms. Most urbanites were impacted. 66% and 42.2% of the population were literate<sup>18</sup>. An increase in mucormycosis (a black fungus infection) during the second COVID-19 pandemic wave, its relationship with severe sequelae, and an increased mortality rate have rendered the disease notifiable in India. Non-sterile medical equipment increases spore contamination and mucormycosis infection risk<sup>19</sup>. Diabetes, hypertension, and coronary artery disease were the most frequent comorbidities among the 70 patients (72%) and (85%). Over half the population may have diabetes<sup>18</sup>. One meta-analysis reported an OR of 2.40; another found an OR of 1.64, and a third found an OR of 2.04. In 120 instances, steroids were overused during the pandemic. COVID-19 participants got large corticosteroid doses of<sup>20</sup>. Rhino-orbital mucormycosis affected 63 people (70

percent)of the patients recovered, 20 (22.2%) were sent to the ICU, and 30% died (40.1percent ). This study confirms the previous findings<sup>21</sup>.

Emergency room doctors must recognize CAM's multiple symptoms and deliver correct triage aspart of regular physical examinations to uncover risk factors. MM patients have a terrible prognosis, but therapy may affect their fate. Medical practitioners in the emergency department (ED) must send necessary investigations, start systemic antifungals early, prevent misuse of antibiotics and systemic steroids, and support early multidisciplinary surgical debridement, including canthotomy. In light of an ongoing COVID-19 pandemicand the increasing number of SARS-CoV-2-infected critically ill patients, risk-based approaches should be developed based on the epidemiological burden of mucormycosis, the prevalence of diabetes mellitus, and the severity of COVID-19 disease, along with immunomodulating agents, including steroids and immunosuppressive agents in cancer and transplant patients. Mucormycosis must be treated as aspergillosis in COVID-19 <sup>22</sup>. Patients with COVID-19 should take corticosteroids carefully and check blood sugar levels. Proper cleanliness and sanitation may reduce the spread of this fungus. Mucormycosis needs additional research to comprehend COVID-19's spread<sup>23</sup>.

## Conclusion

In high-risk patients, COVID-19 may cause mucormycosis. Overuse of steroids is a significant cause of CAM-related diabetes. Regular diabetes management monitoring andcompetent practitioners may detect CAM early.

## References

1. Al Mutair A, Alhumaid S, Alhuqbani WN, Zaidi ARZ, Alkoraisi S, Al-Subaie MF, et al. Clinical, epidemiological, and laboratory characteristics of mild-to-moderate COVID-19 patients in Saudi Arabia: an observational cohort study. *Eur J Med Res.* 2020;25:61.
2. Alisha JM, Alhadjaj AH, Alkhabbaz FL, AlAbduljabar TH, Alsaif A, Alsaif H, et al. Clinical characteristics of asymptomatic and symptomatic COVID-19 patients inthe Eastern Province of Saudi Arabia. *J Infect Public Health.* 2021;14:6–11.
3. Al-Omari A, Alhuqbani WN, Zaidi ARZ, Al-Subaie MF, AlHindi AM, Abogosh AK, et al. Clinical characteristics of non-intensive care unit COVID-19 patients inSaudi Arabia: a descriptive cross-sectional study. *J Infect Public Health.* 2020;13:1639–44.
4. Alsuwaida K. Primary cutaneous mucormycosis complicates the use of adhesivetape tosecure the endotracheal tube. *Can J Anesth.* 2002;49:880–
5. Al-Tawfiq, J.A., Alhumaid, S., Alshukairi, A.N. et al. COVID- And mucormycosis superinfection: the perfect storm. *Infection* (2021).
6. Arjun R, Felix V, Niyas VKM, Kumar MAS, Krishnan RB, Mohan V, et al. COVID-19 associated rhino-orbital mucormycosis: a single center experience often cases. *QJM AnInt J Med.* 2021
7. Bahrani S, Al-Tawfiq JA, Jebakumar AZ, Alghamdi M, Zakary N, Seria M, et al. Clinicalfeatures and outcome of low and high corticosteroids in admitted COVID-19 patients. *J Epidemiol Glob Health.* 2021

8. Chander J, Kaur M, Singla N, Punia RPS, Singhal SK, Attri AK, et al. Mucormycosis: battle with the deadly enemy over five years in India. *J Fungi* 2018;4:46.
9. Cheng S, Zhao Y, Wang F, Chen Y, Kaminga AC, Xu H. Comorbidities' potential impacts on severe and non-severe patients with COVID-19: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2021;100:e24971.
10. Deutsch P.G., Whittaker J., Prasad S. Invasive and non-invasive fungal rhinosinusitis—a review and update of the evidence. *Medicine*. 2019;55:1–14.
11. Giri M, Puri A, Wang T, Guo S. Comparison of clinical manifestations, pre-existing comorbidities, complications and treatment modalities in severe and non-severe COVID-19 patients: a systemic review and meta-analysis. *Sci Prog*. 2021.
12. Hartnett KP, Jackson BR, Perkins KM, Glowicz J, Kerins JL, Black SR, et al. A guide to investigating suspected outbreaks of mucormycosis in healthcare. *J Fungi*. 2019;5:69.
13. Hoang K., Abdo T., Reinersman J.M., Lu R., Higuaita N.I.A. A case of invasive pulmonary mucormycosis resulting from short courses of corticosteroids in a well-controlled diabetic patient. *Med Mycol Case Rep*. 2020;29(1):22–24.
14. Jeong W., Keighley C., Wolfe R. The epidemiology and clinical manifestations of mucormycosis: a systematic review and meta-analysis of case reports. *Clin Microbiol Infect*. 2019;25:26–34.
15. Li X, Zhong X, Wang Y, Zeng X, Luo T, Liu Q. Clinical determinants of the severity of COVID-19: A systematic review and meta-analysis. *PLoS ONE*. 2021.
16. Lionakis M.S., Kontoyiannis D.P. Glucocorticoids and invasive fungal infections. *Lancet*. 2003;362:1828–1838.
17. Maartens G., Wood M.J. The clinical presentation and diagnosis of invasive fungal infections. *J Antimicrob Chemother*. 1991;28(13–22):17–44.
18. Pakdel F, Ahmadikia K, Salehi M, Tabari A, Jafari R, Mehrparvar G, et al. Mucormycosis in patients with COVID-19: a cross-sectional descriptive multicenter study from Iran. *Mycoses*. 2021.
19. Roden MM, Zaoutis TE, Buchanan WL, Knudsen TA, Sarkisova TA, Schaufele RL, et al. Epidemiology and outcome of zygomycosis: a review of 929 reported cases. *Clin Infect Dis* 2005; 41:634–53
20. Singh AK, Singh R, Joshi SR, Misra A. Mucormycosis in COVID-19: A systematic review of cases reported worldwide and in India. *Diabetes Metab Syndr*. 2021;15(4):102146.
21. Skoda A., Pagano L., Groll A. Zygomycosis in Europe: analysis of 230 cases accrued by the registry of the European confederation of Medical Mycology (ECMM) working group on zygomycosis between 2005 and 2007. *Clin Microbiol Infect*. 2011;17(12):1859–1867.
22. Zurl C., Hoenigl M., Schulz E. Autopsy proved pulmonary mucormycosis due to *Rhizopus microsporus* in a critically ill COVID-19 patient with underlying hematological malignancy. *J Fungi (Basel)*. 2021 Jan 27;7(2):88.