



A STUDY OF RISK FACTORS ASSOCIATED WITH MUCORMYCOSIS DURING COVID-19 PANDEMIC

| | |
|----------------------------------|------------------------------------------------------------------------------------------------------|
| Dr. Sachinkumar A. Patel | 3 rd Year Resident Doctor, Department of Physiology, B J Medical College, Ahmedabad. |
| Dr. Hemal A. Panchal | 3 rd Year Resident Doctor, Department of Physiology, B J Medical College, Ahmedabad. |
| Dr. Darshankumar C. Patel | 3 rd Year Resident Doctor, Department of Physiology, B J Medical College, Ahmedabad |
| Dr. Rajendra A. Amin* | Associate Professor, Department of Physiology, B J Medical College, Ahmedabad. *Corresponding Author |

ABSTRACT

Background: During second wave of COVID-19 Pandemic, cells of respiratory tract that were already infected with SARS-CoV2 got invaded by fungal spores in increasing rates and if these two conditions happen in a patient with an underlying disease like diabetes mellitus, A serious Triple threat unfolds. This study attempted to evaluate such risk factors that poses an additional threat during second wave of pandemic. **Aims And Objectives:** The aim of this study was to assess the risk factors for COVID-19 associated Mucormycosis (COVID - Mucor). To see associated risk factors in Mucormycosis patients who have previously diagnosed covid-19 positive and covid-19 negative. **Material And Method:** In this study, we analyzed risk factors for Covid-Mucormycosis patients using data from a cross-sectional study, conducted in the Mucormycosis ward, B J Medical College, Civil Hospital, Ahmedabad, Gujarat. This study covered patients who have been admitted during the period from 14 May 2021 to 08 June 2021. The study was conducted after approval of institutional ethical committee. Risk factors were analyzed among 48 participants: 39 COVID-Mucormycosis (81.25%) and 9 non-COVID-Mucormycosis (18.75%). Patients aged >18 years with confirmed histopathology report of tissue damage or positive fungal culture were included. Cases group included patients with COVID-19 confirmed by RT-PCR or Rapid Antigen Test (RAT) on a nasopharyngeal and Oropharyngeal sample. Control group included subjects with no past history of Covid-19 infection. Study categorical variables were compared between both groups using Fisher's exact test. **Result And Conclusions:** At the end of this study, among all Comorbidity (Prevalence Risk 1.49; p-value = 0.09), Diabetes Mellitus (Prevalence Risk (PR) 1.56; p-value = 0.04) was more common in cases. Corticosteroid use (Prevalence Risk (PR) 3.45; p-value = 0.01) was highly associated with cases of Covid-Mucormycosis and Oxygen Therapy (Prevalence Risk (PR) 2.6; p-value = 0.005) was used only in a majority of patients with COVID-Mucormycosis. In conclusion, factors like Diabetes mellitus, Steroid use, Oxygen Therapy, and COVID-19 itself contribute as interlocked risk factors for COVID-Mucormycosis epidemic. Judicial use of steroids and Oxygen Therapy with screening and optimal control of hyperglycemia can prevent COVID-Mucormycosis.

KEYWORDS : Risk factor, COVID-19, Mucormycosis, Corticosteroid.

INTRODUCTION

The epidemic of Black fungus (COVID-Mucormycosis) manifested as rhino-orbito-cerebral Mucormycosis. This has exacerbated the morbidity among populations during the second wave in 2021(1). According to a recent study, the number of cases of mucormycosis has increased in COVID-19 patients who are either hospitalized or have recovered (2,3,4).

Patients with severe symptoms found relief to certain extent after the use of oxygen therapy and corticosteroids (1,5). However, Corticosteroids by raising blood sugar levels in patients imparts the suitable environment for pathogens to grow and infect the host (6,7).

For Diabetes Mellitus patient's lockdown, travel restrictions, anxiety due to pandemic worsened news and restricted access to medical care have worsened glycemic control. People with type-2 diabetes with high blood sugar levels and iatrogenic immunosuppression are especially vulnerable to mucormycosis (8,9).

A complicated variable such as type-2 diabetes, cancer medications, and alteration of immune system caused by COVID-19 itself may lead to secondary infections. Oxygen therapy support also poses a risk of COVID-Mucormycosis (5,8,10,11).

MATERIAL AND METHOD

This cross-sectional study was conducted on 48 participants:

39 COVID-Mucormycosis (Cases) and 9 non-COVID-Mucormycosis (Controls).

In this study, we analyzed risk factors for Covid-Mucormycosis patients collect data from patients who have been admitted during the period from 14 May 2021 to 08 June 2021 in Mucormycosis ward, B J Medical College, Civil Hospital, Ahmedabad, Gujarat.

After approval from the ethical committee of the institution, patients with evident features of Mucormycosis, confirmed histopathology reports of tissue damage or positive fungal culture were included for the study.

Cases were RT-PCR or Rapid Antigen Test (RAT) positive while Controls had no past history of Covid-19.

Fisher's exact test was employed to study and compare the categorical variables in both the groups. P value of <0.05 was considered statistically significant.

RESULT

The mean age of the 48 patients (39 cases and 9 controls) was 56 years; 77.08% were male and 22.92% were female.

Among all Comorbidity (Prevalence Risk 1.493; p-value = 0.093), Diabetes mellitus (present in 81.25%) remained a strong predisposing factor in both groups where diabetes Mellitus (Prevalence Risk (PR) 1.56; p-value = 0.04) was more

common in cases (COVID-Mucormycosis). Steroid use was common, even in mild disease so Corticosteroid use (Prevalence Risk (PR) 3.454; p-value = 0.016) was highly associated with cases of Covid-Mucormycosis and Oxygen Therapy (Prevalence Risk (PR) 2.6; p-value = 0.005) was used only in a majority of patients with COVID–Mucormycosis. Details are presented in Table 1 & 2.

Table-1 Study Categorical Variables In Comparison Between Case And Control Groups.

| Variables | Total (n=48) | COVID-Mucor (n=39, 81.25%) | Non-COVID-Mucor (n=9, 18.75%) |
|--------------------|--------------|----------------------------|-------------------------------|
| Comorbidity | 41 (85.42%) | 35 (89.74%) | 6 (66.67%) |
| Diabetes Mellitus | 39 (81.25%) | 34 (87.18%) | 5 (55.56%) |
| Corticosteroid Use | 39 (81.25%) | 38 (97.44%) | 6 (66.67%) |
| Oxygen Therapy | 39 (81.25%) | 35 (89.74%) | 2 (22.22%) |

Table-2 Categorical Variables Analysis For Risk Factors For COVID-Mucormycosis

| Variables | Prevalence Risk | p-value | Result |
|--------------------|-----------------|---------|-----------------|
| Comorbidity | 1.493 | 0.093 | Not significant |
| Diabetes Mellitus | 1.569 | 0.043 | Significant |
| Corticosteroid Use | 3.454 | 0.016 | Significant |
| Oxygen Therapy | 2.601 | 0.005 | Significant |

DISCUSSION

After observations and analyzing the results, this study suggested that though the risk factor such as diabetes mellitus are prone to contract the fungal infection, patients with widespread use of steroids develop it early on even for mild COVID-19.

Additionally, there were pointers towards possible determinant such as use of oxygen therapy, immune system alteration caused by COVID-19 itself.

Among all comorbidity (85.42%), Diabetes mellitus was most predisposing factor in both groups, but more common in COVID-Mucormycosis (87.18%). Diabetes mellitus patients had not good glycemic control which give opportunity to invade secondary infection to infect host. High sugar level in blood gives more nutrition to growth fungal or other opportunistic infections. Diabetes mellitus (present in 81.25%) remained a strong predisposing factor in both groups, Diabetes Mellitus (Prevalence Risk (PR) 1.56; p-value = 0.04) was more common in cases (COVID-Mucormycosis). Patients with severe symptoms were given corticosteroids for symptomatic relief but Corticosteroids poses an additional threat (p value less than 0.05)by raising blood sugar levels and steroid use was also significantly associated with mucormycosis (Prevalence Risk (PR) = 3.454; p = 0.016).

Finally, the shortage of availability of oxygen across the whole of India resulted in the use of industrial-grade oxygen in some parts of the country. This was also thought to be a possible risk factor in surge of COVID-19 cases. (Prevalence Risk (PR) = 2.601; p = 0.005).

The diagnosis of non-COVID–Mucormycosis in this study was based on a single negative RT-PCR or Rapid Antigen Test (RAT).

CONCLUSION

Indian mucormycosis epidemic was precipitated by risk factors like diabetes mellitus, widespread use of steroids, Covid-19 infection itself and somewhat use of Oxygen therapy support.

Judicial use of steroid and Oxygen Therapy as well as screening and optimal round the clock monitoring of blood

glucose levels can prevent COVID–Mucormycosis.

REFERENCES:

- [1]. Bhanuprasad K, Manesh A, Devasagayam E, Varghese L, Cherian LM, Kurien R, et al. Risk factors associated with the mucormycosis epidemic during the COVID-19 pandemic. *Int J Infect Dis.* 2021 Oct;111:267–70.
- [2]. Mohammadi F, Badri M, Safari S, Hemmat N. A case report of rhino-facial mucormycosis in a non-diabetic patient with COVID-19: a systematic review of literature and current update. *BMC Infect Dis.* 2021 Dec;21(1):906.
- [3]. Baskar HC, Chandran A, Reddy CS, Singh S. Rhino-orbital mucormycosis in a COVID-19 patient. *BMJ Case Rep.* 2021 Jun;14(6):e244232.
- [4]. Singh Y, Ganesh V, Kumar S, Patel N, Aggarwala R, Soni KD, et al. Coronavirus Disease-Associated Mucormycosis from a Tertiary Care Hospital in India: A Case Series. *Cureus [Internet].* 2021 Jul 3 [cited 2021 Dec 12]; Available from: <https://www.cureus.com/articles/63884-coronavirus-disease-associated-mucormycosis-from-a-tertiary-care-hospital-in-india-a-case-series>.
- [5]. Chavda VP, Apostolopoulos V. Mucormycosis – An opportunistic infection in the aged immunocompromised individual: A reason for concern in COVID-19. *Maturitas.* 2021 Dec;154:58–6.
- [6]. Pal R, Singh B, Bhadada SK, Banerjee M, Bhogal RS, Hage N, et al. COVID-19-associated mucormycosis: An updated systematic review of literature. *Mycoses.* 2021 Dec;64(12):1452–9.
- [7]. R R, Thanthoni M, Warriar AS. COVID-19 Coinfection With Mucormycosis in a Diabetic Patient. *Cureus [Internet].* 2021 Jun 22 [cited 2021 Dec 12]; Available from: <https://www.cureus.com/articles/61344-covid-19-coinfection-with-mucormycosis-in-a-diabetic-patient>.
- [8]. Moothy A, Gaikwad R, Krishna S, Hegde R, Tripathi KK, Kale PG, et al. SARS-CoV-2, Uncontrolled Diabetes and Corticosteroids—An Unholy Trinity in Invasive Fungal Infections of the Maxillofacial Region? A Retrospective, Multi-centric Analysis. *J Maxillofac Oral Surg.* 2021 Sep;20(3):418–25.
- [9]. Ahmadikia K, Hashemi SJ, Khodavaisy S, Getso MI, Alijani N, Badali H, et al. The double-edged sword of systemic corticosteroid therapy in viral pneumonia: A case report and comparative review of influenza-associated mucormycosis versus COVID-19 associated mucormycosis. *Mycoses.* 2021 Aug;64(8):798–808.
- [10]. Solanki B, Chouhan M, Shakrawal N. Mucor Alert: Triad of COVID-19, Corticosteroids Therapy and Uncontrolled Glycemic Index. *Indian J Otolaryngol Head Neck Surg [Internet].* 2021 Aug 8 [cited 2021 Dec 12]; Available from: <https://link.springer.com/10.1007/s12070-021-02801-8>.
- [11]. Kumar M, Sarma DK, Shubham S, Kumawat M, Verma V, Singh B, et al. Mucormycosis in COVID-19 pandemic: Risk factors and linkages. *Curr Res Microb Sci.* 2021 Dec;2:100057.