An Epidemiological Study on Mucormycosis Patients Admitted in Tertiary Care Hospital of Central India

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Abstract

Introduction: The second wave of SAR Cov-2 Infection brought a new menace that was the escalation in the number of mucormycosis, which is a potentially life-threatening, opportunistic, invasive, fungal infection commonly called the “Black fungus”.

Objective: To find out the factors responsible for occurrence of mucormycosis and the pattern that have emerged in the Post SARS – CoV-19 infected cases admitted in tertiary care hospital of Central India.

Material and methods: This descriptive Cross-sectional study was conducted in Government Netaji Subhash Chandra Bose Medical college and hospital of Central India from May 2021 to June 2021. 96 Confirmed cases of mucormycosis were included in this study. The details about Demographical, Epidemiological, clinical data were retrieved by us through interview with patient or his relative and by going through the case sheets of the cases.

Results: The mean age for the mucormycosis was among male is 52.68 ±11.13 years and among female it is 47.47±10.07years. 78% of study subjects were hospitalized for treatment while 22% received treatment at home. 72.40% had steroid intake, Mean duration of steroid therapy was 10.15±5.71 days. Mean duration between steroid therapy and appearance of mucormycosis as 14.21±9.1 while mean duration between Covid infection and mucormycosis was found to be 19.71±9.84 days.

Conclusion: Immunosuppression during Covid -19 treatment had catalyst effect on the development of mucormycosis. Early diagnosis and careful monitoring of immuno-compromised individuals is essential. Steroid and other immune- suppressive drugs should be given cautiously.

Keywords: MUCORMYCOSIS, COVID -19, STEROID, MEAN, EPIDEMIOLOGICAL

Introduction

COVID-19 has played havoc with millions of lives globally. In this highly infectious disease, supportive care plays an essential role in reducing the mortality and morbidity. Gluco-corticoids have shown promising results in the management of COVID-19. They are economical, widely available,
and have shown to decrease mortality in hypoxemic patients with COVID-19. [1] But there also exists a dark side of glucocorticoids, they increase the risk of secondary infections. The risk of opportunistic infections in COVID-19 patients is further enhanced by the immune dysregulation caused by the virus and the use of parallel immunomodulatory drugs such as tocilizumab. [2]

The second wave of SAR Cov-2 Infection brought a new menace that was the escalation in the number of mucormycosis, which is a potentially life-threatening, opportunistic, invasive, fungal infection commonly called the “Black fungus”. By June 7, 2021, about 28,252 cases of mucormycosis had been documented by the Indian Health Ministry. [3] Mucormycosis is one such fungal infection which has taken advantage of this situation thus making the COVID-19 pandemic gloomier and more frightening.

Mucormycosis has emerged as a matter of concern during COVID-19, as a complex spectrum of factors was considered to be facilitating the rise in mucormycosis. The high oxygen saturation in COVID-19 is an ideal environment for the germination of sporangiospores. [4] Another potential cause is immunosuppression caused by systemic immune alterations by COVID-19, coupled with uncontrolled diabetes mellitus (DM), poor glycaemic control, steroid therapy, pre-existing paranasal and airway diseases such as asthma, chronic obstructive pulmonary disease (COPD) and other associated comorbidities. The other factor is prolonged hospitalization and oxygen need with or without ventilator support and also possible nosocomial sources. [1,4] With above speculation we have design this study with an aim to find out the factors responsible for occurrence of mucormycosis and the pattern that have emerged in the Post SARS - CoV-19 infected cases admitted in tertiary care hospital of Central India.

### Methodology

This descriptive Cross-sectional study was conducted in Government Netaji Subhash Chandra Bose Medical college and hospital of Central India from May 2021 to June 2021. First case was admitted on 13th may then cases were keep coming. As during first wave we didn’t see any case with mucormycosis but during the second wave of SARS-CoV-19 many cases of mucormycosis have been reported to our Institution. First 96 Confirmed cases of mucormycosis were included in this study. Confirmation was done by reviewing the clinical and radiological features and demonstration of Mucor on KOH mount or histopathological examination. The details about Demographical, Epidemiological, clinical data were retrieved by us through interview with patient or his relative and by going through the case sheets of the cases. Various factors were reviewed like status of comorbidity, Covid-19 status, treatment history like use of steroids, use of tocilizumab, use of oxygen, duration of hospital stay, change of masks during oxygen therapy etc. The Study was approved by the ethical and scientific Committee of Institution. Data were collected, entered and coded in MS excel sheets, and Descriptive statistics was generated.

### Result

During the second wave of covid-19 pandemic mucormycosis has been emerged as a new threat which raised health care professionals’ concern. In this study 96 cases were studied in which 46% belonged from the rural area while 54% from the urban area. We have seen the high rate of infection among the males which was 81% while the females are less in number only 19%. The mean age for the mucormycosis was among male is 52.68 ±11.13 years and among female it is 47.47±10.07 years. 78% of study subjects were hospitalized for treatment while 22% received treatment at home. [Table 1]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Characteristics</th>
<th>Frequency (%)</th>
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<tbody>
<tr>
<td>Mean Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>52.68 ±11.13 Years</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>47.47±10.07 Years</td>
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Table: 1. Distribution of Mucormycosis patient with respect to epidemiological factors.
Covid-19 was a threat to the patients with comorbidities like diabetes. We’ve seen the diabetes has emerged as a major contribute factor for the mucormycosis. In this study 61.48% patients had diabetes mellitus, 17.73% had hypertension, 15.53% had both diabetes and hypertension, 1% had asthma while only 4.16% had no comorbidities.

Diabetes along with steroid therapy makes a drastic combination for the mucormycosis. In this study 72.40% had steroid intake while only 27.60% hadn’t. Mean duration of steroid therapy was 10.15±5.71 days. Mean duration between steroid therapy and appearance of mucormycosis was 14.21±9.1 while mean duration between Covid infection and mucormycosis was found to be 19.71±9.84 days.

In present study 60% had oxygen therapy, 1% had NIV support and 39% had no oxygen therapy.
The Mean duration of steroid therapy was 10.15±5.71 days. Mean duration between steroid therapy and appearance of mucormycosis was 14.21±9.1 while mean duration between Covid infection and mucormycosis was found to be 19.71±9.84 days.

Nasal hygiene is must, to avoid mucormycosis. In this study we’ve found that 86% patients didn’t maintain nasal hygiene while remaining had maintained.

Discussion

In current study first 96 patients with mucormycosis were included, where most of the patients were in 46 to 55 years of age group with mean age for male was 52.68 ±11.13 Years and for female it was 47.47±10.07 Years. A study by Arora U et al where they found mean age of study population was 48.2 ± 14 years with 226 males (64.2%) while in our study 81% were males. In our study more cases were from urban area which were 54% while rural cases were 46% but Arora U et al found rural cases more at high risk with p<0.001. [5] In our study more cases were from urban area which were 54% while rural cases were 46% but Arora U et al found rural cases more at high risk with p<0.001. In our study 87.5% individuals were given steroids therapy as a treatment for covid-19. Methylprednisolone was the most commonly used followed by dexamethasone. The average duration was 10 days. Similar to Bhanuprasad K et. al. Study on 164 patients 74% covid-19 positive patients were given steroid therapy. [5] Steroid therapy along with diabetes weakens the immunity of the patients and make them vulnerable to the mucormycosis. Hyperglycaemia stimulates fungal proliferation and also causes decrease in chemotaxis and phagocytic efficiency which permits the opportunistic organisms to thrive in acid-rich environment. Predisposing factors like AIDS, uncontrolled diabetes mellitus, cancers such as lymphomas, kidney failure, organ transplant, long term corticosteroid and immunosuppressive therapy, neutropenia, iron overload or hemochromatosis. Similar kinds of findings were reported by many other researchers. [11-19]

This reinforces the fact that diabetes along with compromised immunity status is one important factor for the occurrence of covid-19 associated Mucor mycosis. In the current situation of Covid-19, immunosuppressant has been a major tool to combat the severity of hyper inflammation or viral load in Covid-19 patient, in consequence to it significantly increases the risk to get infected with mucormycosis infection. In our study 87.5% individuals were given steroids therapy as a treatment for covid-19. Methylprednisolone was the most commonly used followed by dexamethasone. The average duration was 10 days. Similar to Bhanuprasad K et. al. Study on 164 patients 74% covid-19 positive patients were given steroid therapy. [5] Steroid therapy along with diabetes weakens the immunity of the patients and make them vulnerable to the mucormycosis. Hyperglycaemia stimulates fungal proliferation and also causes decrease in chemotaxis and phagocytic efficiency which permits the opportunistic organisms to thrive in acid-rich environment. Predisposing factors like AIDS, uncontrolled diabetes mellitus, cancers such as lymphomas, kidney failure, organ transplant, long term corticosteroid and immunosuppressive therapy, neutropenia, iron overload or hemochromatosis. Similar kinds of findings were reported by many other researchers. [11-19]

During the second wave of covid-19 pandemic we’ve seen surge of mucormycosis. Patients with compromised immunity have become susceptible to mucormycosis, which includes uncontrolled diabetes mellitus, solid organ transplantation, neutropenia, malignancies, iron overload, intake of immunosuppressants etc. In our study there is 61.48% patients have been presented with diabetes in which 18.75 % were diagnosed during the covid-19 infection and 37% have uncontrolled diabetes, similar to the study done by Meher R et al. In their study on 131 patients concluded that CAM [Covid Associated mucormycosis] was commonly seen in patients with diabetes [77.09 %] in which 17.5% were newly diagnosed. [8] Martin Hoenigl, et al found that rhino-orbital cerebral infection was more among 55 patients with uncontrolled diabetes with median of 3-5 days (0-50 days) after COVID-19 as compared to a median of 20 days (0-60 days) among patients with controlled. [7] Another study by Kiran Bala, et al found significant association of Diabetes mellitus with rhino-orbito-cerebral presentation (OR = 7.55, P = 0.001) [9]

People who are immunocompromised or take medicines that lower the body’s ability to fight against infections are particularly susceptible. Glucocorticoids have shown promising results in the management of COVID-19. They are inexpensive, widely available, and have shown to reduce mortality in hypoxemic patients with COVID-19. But there also exists a dark side of glucocorticoids, they increase the risk of secondary infections. The risk of opportunistic
infections in COVID-19 patients is further enhanced by the immune dysregulation caused by the virus and the use of concurrent immunomodulatory drugs such as tocilizumab. \cite{20} studies have found that candidates who received corticosteroid for the treatment of COVID-19 was found in 76.3% of cases, followed by remdesivir (20.6%) and tocilizumab (4.1%). \cite{21,22}

In our study 60% mucormycosis patients were on oxygen therapy for at least 8 days. Another study by Mehta & Pandey et al found in a case report that after 10 days of starting of oxygen supplementation, systemic steroids, tocilizumab, meropenem, and oseltamivir the case developed invasive rhino cerebral mucormycosis, and he was kept on ventilator and amphotericin B. but unfortunately case died on day 16. \cite{23}

It has been known facts that for Covid 19 management oxygen demand were increased and in place of Medical oxygen, industrial oxygen was used. This was found as one of the causes for mucormycosis. With Industrial oxygen there is a high chance of compromised quality and hygiene of the oxygen. There was high chance of development of fungal spores in unhygienic water used for the humidification of the oxygen. These all factors and evidences reinforces the role of oxygen therapy in the causation of mucormycosis after covid-19. Kandasamy S, Muthuraju S, Vasugi A, et al also found re-usage of disposable masks, poor quality of oxygen cylinders and poor sterilization of ventilators during the time of COVID-19 crisis. \cite{24}

**Conclusion**

Detailed analysis of clinic-epidemiological features suggests the possibilities of immunosuppression (due to diabetes and use of corticosteroids in treatment of COVID-19) and COVID-19 (endothelial damage, cytokine storm) being the pathogenesis associated with the sudden surge of mucormycosis. Complete Clinico-pathological correlation will help for efficient treatment. Early diagnosis and careful monitoring of immuno-compromised individuals is essential. Steroid and other immune-suppressive drugs should be given cautiously.

**Conflict of interest:** None

**Funding:** self

**References:**


