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Research Article

AN ANALYSIS ON RISK FACTORS OF MUCORMYCOSIS IN POST COVID-19 PATIENTS

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A B S T R A C T

Background*:** In the midst of Covid-19, mucormycosis has become a major threat with rapid increase in the number of cases. It is associated with high morbidity and mortality. Coronavirus disease (COVID-19) increases risk of secondary infections like mucormycosis. We evaluated predisposing factors, for mucormycosis among patients with COVID-19 infection. ***Aim of the Study*:** The predisposing factors of Mucormycosis in post covid-19 patients. ***Material & Methods*:** The study was in 123 patients, observational and hospital based. **Results:** Slight male predominance is seen (59%). The time interval between covid19 and mucormycosis was 27.7 mean days. Majority 62.6% did not have previous history of diabetes, only 37.3% had previous history of diabetes, uncontrolled in 12 cases. Denovo detected diabetes in 32.5% patients, with 17.8% presenting as DKA. Use of intravenous steroids was present in 57.7 % cases ***Conclusion: Moderate to severe COVID 19 cases of all age groups developed Mucormycosis without underlying diabetes and injudicious use of steroids - COVID 19, an independent risk factor. Mild cases without any risk factors developed mucormycosis.

INTRODUCTION

Mucormycosis is going to destroy India in a couple of years." This phrase was written in a mycology text book published in 2018. Ironically mucormycosis has been declared as an epidemic 3 years later. The term "BLACK FUNGUS" is creating a fear in India. However the term Black Fungus is a misnomer. As it causes necrosis of tissues which becomes black it is thought as black fungus. But black fungus are those in which cell wall of hyphae contain melanin.

In the midst of Covid-19 mucormycosis has become a major threat with rapid increase in the number of cases. It has been declared as an epidemic and was made into a notifiable disease under the "EPIDEMIC DISEASE ACT 1987". Because of the epidemic, not only people with covid-19 but people without covid19 but having other risk factors such as diabetes, ketoacidosis are also put under the risk. There has been many speculations regarding the cause of this epidemic. Some say it is because of the excess and unnecessary use of steroid in covid-19 patients, while the rheumatologists argue that there were rarely any cases of mucormycosis inspite of regular use of steroid in their patients.

A high index of suspicion is required for the diagnosis of Mucormycosis[1] and it tends to progress rapidly. It causes high morbidity and mortality. It is an opportunistic invasive fungal infection causing disease in susceptible host. Risk factors[2] of mucormycosis involve 1) diabetes 2) ketoacidosis 3) immune deficiency states like HIV, those on immunosuppressants 4) hematological malignancies 5) use of prolonged corticosteroids[1] such as people with rheumatological diseases 6)history of blood transfusions or iron overload 7) neutropenia

Mucormycosis is a saprophytic fungus that is found ubiquitously in soil and decaying organic matter. It belongs to the subphylum "Mucormycotina" and order "MUCORALES"[1]. These are nonseptate filamentous fungi. It is spread by spores of molds, often by inhalation or contamination of open wounds. The sub phylum mucormycotina contains Mucor, Rhizopus, Rhizomucor and Lichthemia genera. Most fatal infections are caused by Rhizopus oryzae.

Infection usually begins in the nose or mouth and enters the central nervous system via eyes. The symptoms involve one side eye pain, that may be swollen and bulging with blurring of vision, headache, runny nose or blocked nose or sometimes bleeding from nose, facial pain and numbness with the patient appearing to have sinusitis. It is an angioinvasive fungus invading into the blood vessels causing thrombosis leading to the death (necrosis) of tissues by depriving the blood supply[1]. The face may look swollen on one side with rapidly progressing black lesions across the nose or palate. The fungi proliferate in the blood vessels, penetrate the cribriform plate and enter the brain causing rhinocerebral is most common form[3], frontal abscess and cavernous sinus thrombosis. It may also involve lungs, gastrointestinal tract and skin.

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COVID-19 ⟹ DIABETES ⟹ MUCORMYCOSIS

The rise of blood sugars has been detected among the patients with covid-19. The cause of this has not been completely understood. In the viral infection there is a cytokine storm which affects both the insulin release by pancreas as well as the sensitivity of tissue to insulin. Steroid given in moderate to severe disease can also lead to altered blood sugar levels. Other factors such as change in the dietary pattern and stress may also contribute to the altered blood sugar levels.COVID-19 may predispose infected individuals to hyperglycemia and subsequent ketoacidosis that, in turn, promotes the incidence of invasive mycosis through the availability of free iron in serum.[4]

Mechanism: Hyperglycemia directly contributes to the risk of mucormycosis by at least for likely mechanisms- a)hyperglycation of iron sequestering proteins, disrupting normal iron sequestration b) upregulation of mammalian cell receptor (GRP78) that binds to Mucorales, enabling tissue penetration c)induction of poorly characterised defects in phagocytic function d)enhanced expression of CotH, a Mucorales specific protein that mediates host cell invasion by binding to GRP78[1]

Mucormycosis is associated with high mortality (45% to 90%). The main reasons being delay in the diagnosis, high cost of management, and rapid spread due to large population in India. The epidemiology of mucormycosis widely varies between developed and developing countries. However the existing data is from small studies and there is a lack of multicenter data on mucormycosis in developing countries.

Aims

To study the predisposing factors of Mucormycosis in post covid-19 patients

Objectives

1. To find out the involvement of Covid-19 Pandemic in the epidemic of Mucormycosis
2. To detect the early presence of the Predisposing factors.
3. To prevent the occurrence of mucormycosis In these patients

MATERIALS AND METHODS

A cross-sectional observational study, 123 patients was admitted in Government ENT Hospital / Osmania Medical College, Hyderabad from May 25.05.2021 to 25.07.2021 were taken into study.

Inclusion Criteria

1. Age>18 year
2. Patients with mucormycosis proven on Imaging with previous history of covid-19 proven with RTPCR positive or CORADS 5,6 on CT Chest.

Exclusion Criteria

1. Age<18 years
2. Patients symptomatic with RTPCR Negative

Procedure

Required permission was obtained from Government ENT Hospital and Osmania General Hospital to carry out the study. Study was started on May 25th 2021and the study will be continued till July 25th 2021. The patients were asked the questionnaire in the Participant Information Sheet. Appropriate consent was taken from the patients. The patients were explained about the benefits of the study. The patients were told that they can withdraw at any time. Mucormycosis and Covid-19 were confirmed with appropriate investigation methods.

The following data were collected from the patient:

- Previous history of Diabetes
- Denovo Diabetes
- Ketoacidosis or Metabolic acidosis
- Previous history of covid-19
- Use of a ventilator/oxygen therapy
- Use of immunosuppressant drugs/state
- Use of corticosteroid
- Hematologic malignancy
- Blood transfusion/Iron overload

RESULTS

Table 1 Age and Sex Wise Incidence

Age Categories	Count	Percentage
21 TO 30	10	8.1%
31 TO 40	34	27.6%
41 TO 50	43	35.0%
51 TO 60	25	20.3%
61 TO 70	8	6.5%
ABOVE 71	3	2.4%
TOTAL	123	100.0%
MEAN SD	46	11

Sex	Count	Percentage
Male	73	59.3%
Female	50	40.7%
Total	123	100.0%

Table 2 Interval between Covid-19 and Mucormycosis

	Mean	Standard Deviation
Time interval between covid-19 and Mucormycosis (in days)	*27.7*	14.8

Table 3 Admission Into Hospital During COVID-19 Treatment

Whether admitted to Hospital during covid-19 treatment	Count	Percentage
YES	87	70.7%
NO	36	29.3%
TOTAL	123	100.0%

Table 4 Use of Ventilator or Oxygen During COVID-19 Treatment

Use of Ventilator or Oxygen in covid 19 treatment	Count	Percentage
Ventilator	8	6.5%
Oxygen	34	27.6%
Total	123	100.0%

Table 5 Use of Corticosteroids in Covid-19 Treatment

Use of Corticosteroids in COVID 19 treatment	Count	Percentage
YES	71	57.7%
NO	52	42.7%
Total	123	100.0%

Table 6 Previous History of Diabetes Mellitus

Previous History of Diabetics	Count	Percentage
YES	46	37.3%
NO	77	62.6%
TOTAL	123	100.0%

Table 7 Denovo Diabetes

Denovo diabetics	Count	Percentage
YES	40	32.5%
NO	83	67.4%
TOTAL	123	100.0%

Table 8 History of Ketoacidosis

History of Ketoacidosis	COUNT	Percentage
YES	22	17.8%
NO	101	82.1%
TOTAL	123	100.0%

Table 9 History of Prolonged Steroid Use

History of prolonged steroid use	Count	Percentage
YES	20	28.16%
NO	51	71.8%
TOTAL	71	100%

Table 10 Use of Immunosuppressant Drugs

Use of immuno suppressant drugs	Count	Percentage
YES	1	0.8%
NO	122	99.2%
TOTAL	123	100.0%

Table 11 History of Blood Tansfusion or Iron Overload

Ho of Blood Transfusion Iron Overload	Count	Percentage
Yes	2	1.6%
No	121	97.5%
Total	123	100.0%

The results obtained in the present study are analysed as follows:

The study included 123 patients. In the present study, the majority of the study populations were belonging to 41 to 50 years, followed by 31 to 40 years with a mean age of 46 years. Slight male predominance is seen (59.3%). The time interval between covid19 and mucormycosis was 27.7 mean days. History of Hospital admission for COVID 19 present in 59%.Majority 62.6% did not have previous history of diabetes, only 37.3% had previous history of diabetes, uncontrolled in 12 cases. Denovo detected diabetes in 32.5% patients, with 17.8% presenting as DKA. Use of intravenous steroids was present in 57.7 % cases, yet not present in 42.2% cases. But history of prolonged steroid use is seen in few cases 20 out of 71 cases. There were 27.6% patients required oxygen therapy, use of ventilator in only 6.5% present the average hospital stay was 6 days, ventilator usage 5 days, corticosteroid use of 5.8 days and presence of diabetes in years was 6 among study population. History of blood transfusion and iron overload in 2 cases and use of immunosuppressant drugs seen only in one case.

DISCUSSION

Even pre-covid era India reported highest prevalence of mucor mycosis worldwide nearly 70 times that of global estimates[5].Poor glycemic control, systemic steroid therapy, and presence of diabetes are associated with increased risk of Covid associated mucormycosis (CAM).[6] Post covid-19mucormycosis study by Prakash *et al*[7], concluded that diabetes, rampant use of corticosteroid in a background of COVID-19 tends to increase mucormycosis which is relevant to only few cases in our study, because underlying diabetes seen in only 37.3% cases, prolonged use seen only in 20 out of 71 cases with steroid use. In our study 62.6% did not have underlying diabetes, 42.2% cases without steroid use and average steroid use being 5.8 days.

The probability of COVID 19 being risk factor can implicate in moderate to severe cases. In our study there is a significant percentage (42.2 %) mild COVID-19 case, in home isolation developed mucormycosis majority of then being in 41 to 50 year age group. The predominantly proposed risk factors like underlying diabetes and steroid use were absent.

In contrary to study on mucormycosis in post COVID area by Kundakarla *et al*[8] where 97.7% had a previous history of diabetes, 51% had newly detected diabetes,6% had diabetic ketoacidosis,14.4% had oxygen therapy ,2.3% ventilated; our study showed 37.3% with previous history of diabetes, 32.5% with newly detected diabetes,17.8% with diabetic ketoacidosis, 27.7% with oxygen therapy, 6.5% ventilated.

Concluding ,there were less number of cases with previous history of diabetes and newly diagnose diabetes, more no of cases who have used oxygen and ventilator in our study compare to study conducted by Kundakarla *et al*[8]

According to study by Shivakumar Narayana *et al*[9] Median time to CAM diagnosis from COVID-19 onset was 13–18 days Demographic and underlying risk factor data show male predominance (80%), underlying or current diabetes in 60%–80%. In our study Median time to CAM diagnosis from COVID-19 onset was 27 days, showed 37.3% with previous history of diabetes. Our study warrants further research on etiology of mucormycosis in order to reduce future burden of fatal mucormycosis as covid per se may be causing immunosuppresion.

CONCLUSION

1. Moderate to severe COVID 19 cases of all age groups developed Mucormycosis without underlying diabetes and injudicious use of steroids- COVID 19, an independent risk factor.
2. Mild COVID-19 patients of younger age group without underlying diabetes and injudicious use of steroids developed mucormycosis.

References

1. Harrisons Principles of Intenal Medicine,20th Edition, section16 Fungal Infections, Mucormycosis
2. Spelberg, Edwards jjr, Ibrahim A, on novel perspectives on mucormycosis :pathophysiology and management.. 2005.
3. Chakrabarti A, Chatterjee SS, Das A, Panda N, Shivaprakash MR, Kaur A *et al*. Invasive zygomycosis in India: experience in a tertiary care hospital. Postgrad Med J. 2009;85(1009):573- 81.
4. COVID-19 infection may cause ketosis and ketoacidosis.Li J, Wang X, Chen J, Zuo X, Zhang H, Deng ADiabetes Obes Metab. 2020 Oct; 22(10):1935-1941.[PubMed] [Ref list]
5. Chakrabarti A.Dhaliwal M.Epidemiology of mucormycosis in India Curr Fungal Infect Rep. 2013; 7 (Dec 1): 287-292
6. Chakrabarti A.Singh R.Mucormycosis in India: unique features. Mycoses. 2014; 57 (Dec): 85-90
7. Prakash H, Chakrabarti A. Global Epidemiology of Mucormycosis. J Fungi (Basel). 2019;5(1).

8. Kundakarla Bhanuprasad, Abi Manesh, Emily Devasagayam, Lalee VargheseLisa Mary CherianRegi, KurienRajiv, KarthikDivya, DeodharHarshad, VanjareJayanthi PeterJoy, S. MichaelMeera, ThomasPrasanna, SamuelGeorge, M. VargheseRisk factors associated with the mucormycosis epidemic during the COVID-19 pandemic - International Journal of Infectious Diseases: https://doi.org/ 10.1016/j.ijid.2021.08.037
9. Shivakumar Narayana, Joel V Chua,John W Baddley Coronavirus Disease 2019–Associated Mucormycosis: Risk Factors and Mechanisms of Disease https://doi.org/10.1093/cid/ciab726

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