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Original Research Article

Emergence of mucormycosis following second wave of COVID-19 pandemic and possible risk factors in a hilly state of North India

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ABSTRACT

Background: Mucormycosis is a rare, highly aggressive fungal infection affecting the rhino-orbital, respiratory, gastrointestinal or cutaneous systems and is caused by a group of moulds called mucoromycetes belonging to order Mucorales and has been associated with corona pandemic. The aim of the study was to assess the emerging trends of mucormycosis following second wave of Corona pandemic and possible risk factors in a hilly state of North India.
Methods: It was a retrospective data analysis study where the information's were gathered from various sources in state of Himachal Pradesh. After detection of 1st case, data was collected from May 2021 to July 2021. Since objective and authentic data was released by different agencies daily, so the state profile of mucormycosis cases was taken as per information available from newspapers, various state websites and analysed for various parameters.
Results: The current study conducted in state of Himachal Pradesh showed that Hamirpur was the worst hit district with affected population 0.002%, with case fatality rate 57%. While male mortality was more (60%) as compared to female mortality (40%).
Conclusions: This study showed that underlying risk factors for mucormycosis were COVID-19 infection, un-controlled diabetes, steroid and oxygen use.

Keywords: Mucormycosis, Emergence, COVID-19 second wave, Risk factors

INTRODUCTION

Mucormycosis is a rare, highly aggressive fungal infection affecting the rhino-orbital, respiratory, gastrointestinal or cutaneous systems and is caused by a group of moulds called mucormycetes belonging to order Mucorales.[1] These fungi live throughout the environment, particularly in soil and in decaying organic matter.[2] Route of spread of Mucorales can occur via inhalation or ingestion of spores or via direct inoculation.[3] Following the initial infection, there is rapid invasion of blood vessels leading to thrombosis and tissue necrosis.[4] In general, these fungi are not harmful to most people. However, people with weakened immune systems are more likely to get mucormycosis such as Diabetes, Long-term corticosteroid use, prolonged oxygen therapy.[5] In Himachal Pradesh, there had been a sudden emergence of mucormycosis cases during the second wave of corona pandemic. The aim of the study was to provide better insight into the disease burden, population characteristic, risk factors and outcomes of these patients.

METHODS

It was a retrospective data analysis study where the information's were gathered from various sources in state of Himachal Pradesh. After detection of 1st case, data was collected from May 2021 to July 2021. Since objective and authentic data was released by different agencies daily, so the state profile of mucormycosis cases was taken as per information available from newpapers and various state websites. The results were documented and trends were analysed using various formulas. The results were expressed as numbers and percentages.

RESULTS

The relevant observations were arranged in tabulated form and analysed for pattern of disease geographically. Total cases of mucormycosis reported in Himachal Pradesh were 28. The sudden emergence of mucormycosis was definitely related to COVID-19 pandemic but it was also seen in high risk groups such as diabetes in 57% (16 cases), steroid use in 28.5% (8 cases) and oxygen use in 25% (7 cases) of the hospitalised patients of mucormycosis. Immunocompromised status was present in 21.4% (6 cases) of the patients.

Sixty one percent (17 cases) of mucormycosis cases were having rhino-cerebral type of disease, 7% (2 cases) cases with disseminated type and 32% (9 cases) with uncommon presentation. Out of 32% (9 cases) with uncommon presentation, 55.6% (5 cases) had cutaneous mucormycosis, 33.3% (3 cases) had gastro-intestinal type and 11% (1 case) had pulmonary type. Mucormycosis was present in 85.7% (24 cases) of post-COVID-19 patients, while rest of 14.3% (4 cases) were having no relation with COVID-19 infection. Out of 4 non-COVID-19 cases, one case had uncontrolled diabetes with history of steroid and oxygen use while second case had uncontrolled diabetes with immunocompromised status and third case had only immunocompromised status. No associated risk factor was found in fourth case. All of these were diagnosed based on presence of black nasal plaque during routine ENT examination and later confirmed by RT-PCR.

Population wise biggest district of the state, Kangra had highest number of mucormycosis cases in comparison to other district like Hamirpur, Shimla, Solan, Mandi, Kullu and Sirmour in descending order. Population wise most affected district was Hamirpur with affected population 0.002%, followed by Kangra 0.0007%, Solan 0.0005%, Shimla 0.0004% and Mandi, Kullu, Sirmour each with affected population 0.0002% (Table 1).

Case fatality rate in Himachal Pradesh in the first week of July 2021, was 35.7% which was higher than the Indian average of 7.3% at that time. Hamirpur was the first worst hit district with case fatality rate of 57%, which was greater than the state average of 35.7% at that time, followed by Kangra with case fatality rate of 36 %. Shimla and Solan each had case fatality rate of 33%. Mandi, Kullu and Sirmour district although recorded mucormycosis cases but no deaths. Not even a single case of mucormycosis was reported from other districts (Table 2).

Total mucormycosis deaths reported in the state of Himachal Pradesh were 10, with more male mortality 60% (6 cases) as compared to female 40% (4 cases). About 40% (4 cases) of the patients died, were in age group of 51-60 years, 30% (3 cases) in the age group of 61-70 years and 10% (1 case) each in age group of 31-40 years, 41-50 years and 71-80 years.

Table 1: District wise breakdown of mucormycosis cases and percentage of population affected in Himachal Pradesh.

Name of district	Total confirmed cases	Total population (2011 census)	Percentage of population affected
Kangra	11	15,10000	0.0007
Hamirpur	7	4.55 lakhs	0.002
Shimla	3	8.14 lakhs	0.0004
Solan	3	5.8 lakhs	0.0005
Mandi	2	9,99,777	0.0002
Kullu	1	4.38 lakhs	0.0002
Sirmour	1	5.3 lakhs	0.0002
Bilaspur	-	3.8 lakhs	-
Chamba	-	5.19 lakhs	-
Kinnaur	-	84,121	-
Lahul and Spiti	-	31,564	-
Una	-	5,21,173	-
Himachal Pradesh	28	68,64,602	0.0004

Table 2: District wise case fatality rate of mucormycosis in Himachal Pradesh.

Name of district	Total confirmed cases	Deaths	Case fertility rate
Kangra	11	4	36
Hamirpur	7	4	57
Shimla	3	1	33
Solan	3	1	33
Mandi	2	-	-
Kullu	1	-	-
Sirmour	1	-	-
Bilaspur	-	-	-
Chamba	-	-	-
Kinnaur	-	-	-
Lahul and Spiti	-	-	-
Una	-	-	-
Himachal Pradesh	28	10	35.7

DISCUSSION

Mucormycetes are a group of moulds belonging to order Mucorales, are the etiological agents of mucormycosis.[2] A study at four major tertiary care hospital in 2013-2015 reported 388 mcormycosis cases, nearly 56% of whom were reported as having uncontrolled diabetes. Trauma was reported in only 10% cases. This study also found a greater proportion of fungal infection in north India along with higher mortality (46.7%).[6] Incidence and prevalence of this disease is difficult to estimate because of various

factors including lack of awareness of the disease even among trained physicians and lack of standardized diagnostic strategies.[7] An increase in the incidence of mucormycosis has been seen in recent decades.[3] This is exemplified by the 7.3% yearly increase in France between 2001-2010.[8] Community-onset outbreaks have been associated with trauma sustained during natural disasters.[9,10]

India's overall mucormycosis prevalence is 0.14 cases per 1,000 population. The overall mortality in mucormycosis when well-treated, ranges from 30% to 46.7%.[11] Rhino-orbitocerebral presentation is the predominant form, possibly because of its association with diabetes.[12] Cutaneous mucormycosis is the third most common manifestation of mucormycosis.[3]

The first case of mucormycosis in Himachal Pradesh was recorded on 20th May 2021 in a 52 years old female with co-morbid conditions like diabetes mellitus and hypertension. She presented with complains of loss of vision in one eye. First fatality occurred within eight days of the first case, on 28th May 2021, when two post-COVID-19 male patients aged 38 years and 49 years old having uncontrolled diabetes, died of mucormycosis.

During the first wave, not even a single case of mucormycosis was detected. The possible reason could be the use of steroid and industrial oxygen, which was not there in policy during first wave of corona pandemic. While in second wave, steroid and oxygen was used in 28.5% and 25% of the hospitalised patients respectively. 57% of the patients suffering from mucormycosis were having pre-existing diabetes. So, in this study, diabetes was one of the major risk factors for mucormycosis followed by prolonged steroid and oxygen use. 21.4% of the patients were immunocompromised. Hamirpur was most affected district with 0.002% population having mucormycosis. Least affected districts were Mandi, Kullu and Sirmour. Unmonitored use of steroid particularly in diabetes may be the factor responsible for rise in mucormycosis cases which need to be further investigated.

Overall, case fatality rate in Himachal Pradesh during the first week of July was 35.7%. Most-worst hit district was Hamirpur with case fatality rate of 57%. Cases also reported from Mandi, Kullu and Sirmour district but no deaths. No case of mucormycosis was reported from other districts. 90% of patients who died had suffered COVID-19 infection at some stage. The reason for higher case fatality rate in Himachal may be the late referral of the cases from peripheral hospitals to the tertiary care hospitals. Another reason being site of involvement, as 60% cases who died, were having rhino cerebral and 40% cases with uncommon presentation (cutaneous, gastro-intestinal and pulmonary types). Reasons being both these type carries maximum mortality. Government of Himachal Pradesh declared mucormycosis as an epidemic and notifiable disease for one year on 21st May 2021. The anti-fungal agents with lowest minimum inhibitory concentrations for Mucorales are amphotericin-B, isavuconazole and posaconazole but the minimum inhibitory concentrations vary widely depending on the genus and species.[13] Prompt diagnosis and rapid initiation of anti-fungal therapy combined with surgical removal of infected tissues are required for optimal outcomes. In addition, control of underlying condition and reduction of immunosuppression are important components of treatment.[14] The current study presented the emerging trends of mucormycosis and possible risk factors in the state of Himachal Pradesh. Vulnerable groups at higher risk could be identified and their risk can be reduced by protecting themselves from the fungi in the environment.

Strength of study is that the mucormycosis having high mortality needs to be detected well in time and screening of risk groups for disease to reduce fatality.

Limitation of the study was that it was retrospective data-based study and larger picture of the disease might emerge in future which may put light on its pattern.

CONCLUSION

This study showed that in Himachal Pradesh, mortality due to mucormycosis was higher in males as compared to females and Hamirpur was the worst hit district. Underlying risk fac-tors were COVID-19 infection, uncontrolled diabetes, prolonged steroid and oxygen use. All the risk factors need to be addressed well in time to prevent further relapses and to reduce the burden of fatal mucormycosis.

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REFERENCES

1. Adam RD, Hunter G, Tomasso J, Comerci G. Mucormycosis: emerging prominence of cutaneous infections. Clin Infect Dis. 1994;19(1):67-76.
2. Richardson M. The ecology of the Zygomycetes and its impact on environmental exposure. Clin Microbiol Infect. 2009;15(5):2-9.
3. Suthananthan AE, Koek SA, Sieunarine K. Cutaneous mucormycosis in an immunocompromised patient: a case report. J Surg Case Rep. 2017;2017(3):56.
4. B inder U, Maurer E, Flörl C. Mucormycosis--from the pathogens to the disease. Clin Microbiol Infect. 2014;20(6):60-6.
5. Walsh TJ, Gamaletsou MN, McGinnis MR, Hayden RT, Kontoyiannis DP. Early clinical and laboratory diagnosis of invasive pulmonary, extrapulmonary, and disseminated mucormycosis (zygomycosis). Clin Infect Dis. 2012;54(1):55-60.
6. Prakash H, Ghosh AK, Rudramurthy SM, Singh P, Xess I, Savio J, et al. A prospective multicenter study

on mucormycosis in India: Epidemiology, diagnosis, and treatment. Med Mycol. 2019;57(4):395-402.
7. Prakash H, Chakrabarti A. Global Epidemiology of Mucormycosis. J Fungi (Basel). 20191;5(1):26.
8. Bitar D, Lortholary O, Strat Y, Nicolau J, Coignard B, Tattevin P, et al. Population-based analysis of invasive fungal infections, France, 2001-2010. Emerg Infect Dis. 2014;20(7):1149-55.
9. Neblett FR, Benedict K, Bos J, Bennett SD, Lo YC, Adebanjo T, et al. Necrotizing cutaneous mucormycosis after a tornado in Joplin, Missouri, in 2011. N Engl J Med. 2012;367(23):2214-25.
10. Patiño JF, Castro D, Valencia A, Morales P. Necrotizing soft tissue lesions after a volcanic cataclysm. World J Surg. 1991;15(2):240-7.
11. Chakarbarti A, Sood P, Denning D. Estimating fungal infection burden in India using computational models: Mucormycosis burden as a case study. Germany: 23rd ECCMID conference Berlin; 2014.
12. Chakrabarti A, Singh R. The emerging epidemiology of mould infections in developing countries. Curr Opin Infect Dis. 2011;24(6):521-6.
13. Arendrup MC, Jensen RH, Meletiadis J. In Vitro Activity of Isavuconazole and Comparators against Clinical Isolates of the Mucorales Order. Antimicrob Agents Chemother. 2015;59(12):7735-42.
14. Spellberg B, Edwards J, Ibrahim A. Novel perspectives on mucormycosis: pathophysiology, presentation, and management. Clin Microbiol Rev. 2005;18(3):556-69.

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