

## Introduction

- Mucormycosis is an angioinvasive, aggressively devastating and life-threatening fungal infection essentially requiring timely intervention thereby prompt treatment.
- The incidence of mucormycosis, mixed with other invasive mycoses is increasing gradually with rise in the vulnerable population, especially among those presenting with uncontrolled diabetes mellitus.
- During recent times, we encountered mucormycosis mixed with other mycoses, whereby there was concomitant infection with hyaline or dematiaceous molds and/or yeasts.
- The present study intends to evaluate the increasing trend of mucormycosis along with such infections and the underlying significant risk factors with poor prognosis if timely intervention is not instituted.

## Material and Methods

- A total of seventeen cases of mixed infection occurred during last five years from January 2013 to December 2017.
- Biopsy tissue from nasal cavity in rhino-orbital infection, necrotic tissue from cutaneous infection and sputum in case of pulmonary mucormycosis was processed for conventional mycological examination.
- Fungal etiology was established by direct examination of KOH wet mount, CFW staining and fungal culture on media like SDA and BHIA.
- The morphological identification of fungal isolates was done by LCB preparation.
- Histopathology study of tissue sections stained by hematoxylin and eosin (H&E), periodic acid-Schiff (PAS), Gomori methenamine silver (GMS) and Masson-Fontana (MF) stainings was done.
- The final diagnosis of isolates was established on the basis of molecular identification done by sequencing ITS region of isolates and compared with those of type strains.
- *In vitro* antifungal susceptibility testing of all mucoralean fungi was done by broth microdilution method according to the Clinical and Laboratory Standard Institute (CLSI) document M38-A2.

## Results

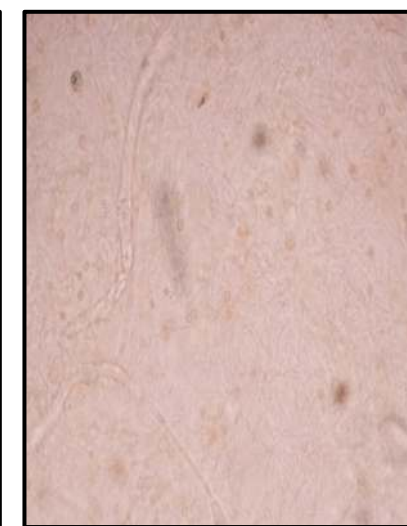
- Thirteen cases were rhino-orbital clinical type, two each of pulmonary and cutaneous types of mucormycosis.
- *Rhizopus arrhizus* and *Aspergillus flavus* were isolated from six rhino-orbital cases and one from pulmonary case.
- *Rhizopus arrhizus* and *Alternaria alternata* were isolated from one rhino-orbital case while *Lichtheimia corymbifera* and *Aspergillus flavus* were isolated from one pulmonary case.
- Two patients showed *Candida tropicalis* and one showed *Aspergillus fumigatus* along with the direct positive findings of aseptate hyphae.
- The remaining cases turned out to be sterile on culture despite direct KOH/CFW showed mixed fungal etiology.
- Thirteen cases had underlying diabetes mellitus Type-II as the underlying risk factor.
- In addition, a significant risk factor in cutaneous type was the history of taking intramuscular injection at the affected site.
- AFST revealed all strains were sensitive to amphotericin B and posaconazole.
- All patients were treated with extensive surgical debridement and intravenous liposomal amphotericin B with good prognosis thereby eventually their survival.
- The results are also shown in tabulated form as well as figures as clinical photographs and photomicrographs.

Isolate	Site / clinical type	Risk factor	Treatment	Outcome of therapy
<i>Rhizopus arrhizus</i> <i>Aspergillus flavus</i>	Six rhino-orbital cases, one pulmonary case	DM type II, allergy to dust (one rhino-orbital case)	Surgical debridement + L-AMB	Five survived, one expired
<i>Rhizopus arrhizus</i> <i>Alternaria alternata</i>	One rhino-orbital case	DM type II	Surgical debridement + L-AMB	Survived
<i>Lichtheimia corymbifera</i> <i>Aspergillus flavus</i>	One pulmonary case	DM type II	L-AMB	Survived
<i>Rhizopus arrhizus</i> <i>Candida tropicalis</i>	One rhino-orbital case	Chronic kidney disease	L-AMB	Survived
<i>Aspergillus flavus</i> <i>Candida tropicalis</i>	One rhino-orbital case	DM type II	Surgical debridement + L-AMB	Survived
<i>Aspergillus fumigatus</i>	One rhino-orbital case	DM type II	L-AMB	Survived
Sterile	Three rhino-orbital cases	DM type II	Surgical debridement + L-AMB	Survived
Sterile	Two Cutaneous cases	Intramuscular injection	Surgical debridement + L-AMB	One expired, one survived

**Table** Depicting details of mucormycosis with other invasive mycoses



**Fig. 1.** Bilateral ROCM with chemosis and proptosis



**Fig. 2.** KOH wet mount showing aseptate and septate hyphae



**Fig. 3.** CFW staining showing aseptate and septate hyphae

## Discussion

- There has been an upsurge in cases of mixed fungal infection with a growing susceptible population.
- Diabetes mellitus appears to be a significant risk factor for the development of such infections to thrive and establish.
- Intramuscular injection has a major role in causation of cutaneous mixed infections.
- These mixed fungal infections carry poor prognosis, often leading to fatal consequences, if not timely managed.
- The aggressive nature of disease warrants a prompt and aggressive treatment regimen in order to save the life of patient.
- Amphotericin B is the mainstay therapeutic drug for treatment along with extensive surgical debridement/resection and control of risk factors.

## References

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