

Acremonium keratitis: Risk factors, clinical characteristics, management, and outcome in 65 cases

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Purpose: To study the risk factors, clinical presentation, management options, and outcomes in cases of culture-proven *Acremonium* keratitis. **Methods:** Medical and microbiology records of culture-proven *Acremonium* keratitis from Jan 2007 to Dec 2019 at a tertiary eye care center were reviewed. Details of clinical findings on each visit and operating notes were reviewed from the medical records. All cases were subjected to corneal scraping at the first visit for microbiological investigation consisting of direct smear examination and culture. Topical natamycin 5% was the mainstay of medical treatment. Surgical treatment was considered for nonresponding patients. **Results:** During the 13-year study period, 65 cases of culture-proven *Acremonium* keratitis were identified out of 1605 cases of fungal keratitis. Trauma was the most common predisposing factor in 32 cases (49.2%). The average area of the corneal stromal infiltrate was 24.8 mm² at the initial presentation. Hypopyon at the time of presentation was evident in 28 (43.1%) cases. *Staphylococcus* spp. was the most common ($n = 22$, 33.8%) organism coexistent with *Acremonium*. Direct microscopy of corneal scraping was positive for fungal filaments in 57/65 (87.6%) cases. Medical management alone was given in 44 patients (67.6%). Age (>50 years) and treatment delay (>15 days) were found to be independent risk factors for the poor final visual outcome (VA <20/60). **Conclusion:** When treated early, *Acremonium* keratitis responds well to medical therapy with currently available topical antifungals. However, advanced and nonresponding cases require surgical intervention for resolution of the infection.

Key words: *Acremonium*, corneal infection, microbial keratitis, *Staphylococcus*

Corneal ulceration is a major cause of monocular blindness second to cataracts in developing countries.^[1] Currently, fungal keratitis is emerging as a common etiology for severe sight-threatening ocular diseases. Srinivasan *et al.*^[2] have reported a 46.8% prevalence of fungal corneal infection among all culture-positive cases. It has been observed that the number of smear-positive bacterial pathogens has been declining, whereas fungus-related keratitis has been rising consistently.^[3] The most common species causing fungal keratitis have been identified to be *Fusarium*, *Aspergillus*, and *Curvularia* among filamentous fungi and *Candida* among the yeast groups.^[4] Laspina *et al.*^[5] from South America have reported fungi to be contributing to 26% of all culture-positive cases, of which *Acremonium* comprised 40% followed by *Fusarium* (15%). Das *et al.*^[6] have reported a series of 17 cases of ocular infections caused by various species of *Acremonium* causing keratitis and endophthalmitis. *Acremonium* keratitis following laser-assisted *in situ* keratomileusis (LASIK) has also been reported in four cases.^[7] Sahay *et al.*, in their comprehensive review, have mentioned *Acremonium* as a rare and emerging microorganism causing keratitis, citing various case series across the world.^[8]

Acremonium is a filamentous, septate, non-branching fungus that was previously known as *Cephalosporium*.^[9] It is an environmental saprophyte and has been commonly isolated from soil and debris. It has been variedly classified as deuteromycetes by some groups and ascomycetes by a few others. There has been a recent restructuring of the nomenclature.^[10] The genus *Acremonium* consists of 150 different species, of which a few are pathogenic to the human beings.^[11,12] *Acremonium* is an environmental saprophyte causing keratitis in human beings. The clinical features and microbiological appearance in smear and culture closely resemble *Fusarium* spp. This retrospective single-center study analyzes the risk factors, clinical profile, response to treatment, and outcome of all cases diagnosed as culture-proven *Acremonium* keratitis.

Methods

Medical and laboratory records of all culture-positive patients of *Acremonium* keratitis presenting at a tertiary eye care center in eastern India, from Jan 2007 to Dec 2019, were retrospectively analyzed. The present study was approved by the Institutional

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Review Board (2019-135-IM-27), and it adhered to the tenets of the Declaration of Helsinki. All patients diagnosed clinically with microbial keratitis underwent detailed microbiological evaluation as per the institute protocol.^[13] The corneal scrapings were obtained by a sterile blade#15 on the Bard Parker handle and smeared on glass slides (Gram's stain, potassium hydroxide [KOH] mount, Giemsa stain, and acid-fast stains, when indicated). Thereafter, subsequent scrapings were inoculated directly onto sheep blood agar, chocolate agar, non-nutrient agar, Sabouraud dextrose agar (SDA), potato dextrose agar (PDA), thioglycolate, and brain–heart infusion broth and incubated at 37°C (except SDA and PDA which were incubated at 25°C). A culture was considered significant in the presence of growth of the same organism on two or more media, confluent growth at the site of inoculation in at least one solid medium, growth in one medium with consistent direct microscopy findings, or growth of the same organism on repeated corneal scraping. For mixed infection also, similar significance criteria were used before accepting a bacterial isolate as significant.

All culture-proven cases of *Acremonium* species were included in the study. Data included patient demographics, risk factors, previous treatment, duration of symptoms, clinical details including the size of infiltration, presence of hypopyon, posterior segment involvement, microbiology results, the coexistence of any other pathogen, and treatment details including medical and surgical management and outcome of treatment. As per our institute protocol mentioned above, corneal scrapings from the margins and base of ulcers were subjected to direct microscopy examination after staining with Gram's stain and KOH with calcofluor white (KOH + CFW). Scrapings were also inoculated into solid and liquid media for culture and susceptibility testing. In a few cases, exudates from the anterior chamber (AC), vitreous fluid, and half-corneal button were also used for microbiological evaluation.

Medical treatment in the form of topical natamycin 5% eye drops with or without systemic antifungals (ketoconazole, fluconazole, itraconazole) was commenced based on the initial smear report in all cases, which was later confirmed by culture. Baseline blood sugar and liver function tests were done to rule out coexisting diabetes status and before starting systemic ketoconazole. In those cases where systemic antifungal was necessary but had deranged liver function tests, itraconazole or fluconazole was prescribed instead of ketoconazole. In cases where the coexisting pathogen-like bacterium was identified, additional antibiotic in the form of fluoroquinolone was started along with antifungals wherever indicated. Antibiotic treatment was further modified wherever necessary based on the clinical response and susceptibility report. In cases where the infiltrate had started resolving with antifungals alone and bacteria was isolated later in culture, no further antibiotic was added. Those patients with total corneal ulcers at presentation, poorly responding to medical management, or worsening during treatment were subjected to one or more surgical interventions in the form of AC wash, intracameral and intrastromal voriconazole injections, cyanoacrylate glue application, therapeutic penetrating keratoplasty, pars plana vitrectomy, and intravitreal antifungal injections.

We used simple logistic regression and multiple logistic regression analyses to estimate the risk factors: age (>50 years), history of trauma, delay in treatment (>15 days), area of

infiltrate (>20 mm²), and presence of hypopyon with the final visual outcome (worse than 20/60) and need for a prolonged duration of treatment (>30 days). The outcome of differences between the eyes with Visual Acuity (VA) better/worse than 20/60 and the eyes with treatment delay as mentioned was assessed using the Chi-square test. A *P* value of <0.05 was considered significant. Statistical software R (a language and environment for statistical computing; R Foundation for Statistical Computing, Vienna, Austria; <https://www.R-project.org/>) was used to analyze the data.

Results

A total of 65 cases of *Acremonium* keratitis were isolated over the 13-year study period at our institute. The average age of the patients was 50.9 ± 16.3 years (range: 15–89 years). Males were more affected (*n* = 47, 72.3%). The average duration of symptoms before presentation was 25 days (median = 15, range: 3–120 days).

Predisposing risk factors

Before presentation at our institute, 86.1% (56/65 patients) were on some topical treatment in the form of antibiotic (*n* = 14), antifungal (*n* = 8), a combination of antibiotic and antifungal (*n* = 19), antiviral (*n* = 2), and a combination of antibiotic, antifungal, and antiviral (*n* = 1). Six eyes (9%) were on topical steroids and one eye received topical nonsteroidal agents before presenting to us. A history of trauma was found in 32 cases (49.2%), of which the most common were with vegetable matter (*n* = 13, 20%) followed by wooden stick injury (*n* = 4, 6%) [Table 1].

Clinical features

All patients presented with symptoms of pain, redness, watering, photophobia, and diminution of vision of variable severity and duration. Ten patients presented with characteristic features of dry-looking elevated infiltrate with hypophate borders. The size of infiltrate varied from 1 to 11 mm, with an average of 8.2 mm (longest meridian) and 4.9 mm (perpendicular meridian). Most of the ulcers were centrally located (*n* = 35, 53.8%). Total

Table 1: Predisposing factors (n=42, 64.6%)

Predisposing Factors	Number (n)
Trauma (n=32)	
Vegetable matter	13
Wooden stick	4
Cow's tail	2
Nail injury	3
Fall of soil	4
Fall of cow dung	1
Others	3
Unknown trauma	2
Prior surgery	2
Lagophthalmos	1
Nasolacrimal duct obstruction	1
Systemic (n=6)	
Diabetes mellitus	4
Tuberculosis	1
Hansen's disease	1

corneal involvement was seen in three cases at the time of presentation. Eighteen eyes (27.7%) presented with significant thinning and three eyes had corneal perforation at presentation. Limbal involvement was observed in seven eyes (10.7%). Other features such as endoexudates and ring infiltration were evident in seven and two eyes, respectively. Hypopyon was observed in 28 eyes (43.1%) with height varying from streak (<1 mm) to more than half the AC [Fig. 1]. Ocular involvement was limited to keratitis in 62 cases. However, three cases had coexisting endophthalmitis along with keratitis at the time of presentation. Visual acuity at presentation varied from 20/20 to Perception of Light (PL) + Projection of Rays (PR) inaccurate.

Microbiological analysis

Corneal scrapings were used for microbiological diagnosis in all cases. In three eyes, which had posterior segment involvement, a vitreous biopsy was additionally performed for microbiological evaluation. AC exudates were obtained in two eyes for diagnosis. Half-corneal button attained after therapeutic penetrating keratoplasty was used for diagnosis in three eyes. Direct microscopy of the smear from corneal scrapings showed the presence of septate, branching fungal filaments in 57 samples (87.7%). The median time taken for the organism to grow in culture was 2 days (mean 3.1 ± 2.3 , range 1–15 days) [Fig. 2]. The coexistence of another organism was seen in 31 eyes (47.7%). Of these, *Staphylococcus* spp. was the most common co-pathogen (22 eyes, 70.9%). The organisms found coexisting were *Corynebacterium* spp. ($n=3$), *Pseudomonas*

spp. ($n=2$), and coagulase-negative staphylococci ($n=2$). Polymicrobial infection was seen in two cases where *Candida* along with *Acremonium* were isolated.

Management

Topical natamycin 5% eyedrop was prescribed in 26 eyes (40%), and topical natamycin along with one of the systemic azoles was prescribed in 32 cases (49.2%) in the form of ketoconazole ($n=23$), itraconazole ($n=8$), and fluconazole ($n=1$). Systemic antifungals were added in large ulcers (>6 mm), close to the limbus, and with deeper corneal involvement (posterior stromal involvement). Topical antifungals and topical fluoroquinolones (gatifloxacin 0.5%, $n=7$ or ciprofloxacin 0.3%, $n=2$) were prescribed in mixed infections ($n=9$, 13.8%). Coexisting bacteria were detected either in microscopy or in the culture of the corneal scraping and did not warrant adjuvant antibiotic in most cases as the ulcer was already responding to antifungals. Surgical intervention was required in 21 eyes (32.3%) in the form of tissue adhesive ($n=6$), superficial keratectomy ($n=1$), AC wash with intrastromal injections ($n=1$), therapeutic keratoplasty ($n=15$), intravitreal amphotericin B injections ($n=3$), pars plana vitrectomy and intravitreal amphotericin B injections ($n=1$), and tarsorrhaphy ($n=1$). Six eyes required more than one procedure for resolution of the infection. The recipient size for therapeutic penetrating keratoplasty ranged from 8 to 11.5 mm (median=9). During surgery, care was taken to remove the infected host cornea with a clear 0.5–1 mm margin all around, along with irrigation of the angles to eradicate possible hidden nidus of infection. The interrupted suturing technique was practiced in all cases, and an intracameral voriconazole injection was administered at the end of the surgery. One case had intraoperative lens extrusion and another patient required pars plana vitrectomy postoperatively as the infection had extended into the posterior segment. Postoperative treatment included topical natamycin 5% eyedrop and systemic antifungal (oral ketoconazole 200 mg twice daily (BD) or oral itraconazole 100 mg BD depending on the hepatic health status).

Outcome

Out of 65 cases, 11 patients were lost to follow-up. Post-keratitis scarring was observed in 34 eyes (63%). Three eyes eventually became phthisical and one eye developed anterior staphyloma. Among the 15 eyes that underwent therapeutic keratoplasty, clear graft was observed in five eyes (33.3%), failed graft in nine eyes (60%), and one eye developed phthisis bulbi after keratoplasty. In our series, 13 of 34 patients (38.2%) had a history of trauma and had responded to medical management. Also, 10 of 21 patients (47.6%) had a history of trauma and required surgical intervention. Out of the 54 eyes that were examined till the resolution of infection, visual acuity recorded was better than 20/60 ($n=19$, 35.1%), 20/60–20/200 ($n=11$, 20.3%), and worse than 20/200 ($n=24$, 44.4%).

The univariate logistic regression revealed that age (>50 years, odds ratio [OR]: 3.39, 95% confidence interval [CI]: 1.05–10.95; $P=0.04$) and treatment delay (>15 days, OR: 13.8, 95% CI: 3.3–57.67; $P<0.001$) were independent significant risk factors for poor vision (<20/60) [Table 2].

a. *Interpretation for age:* Patients aged > 50 years (yes) were 3.39 (OR: 3.39, 95% CI: 1.05–10.95; $P=0.04$) times more at risk for poor vision (<20/60) compared to patients aged ≤ 50 years, which was statistically significant.

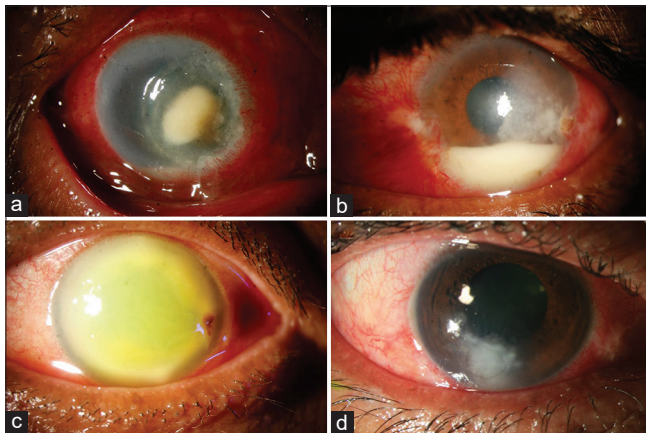


Figure 1: Slit-lamp photograph in diffuse illumination showing (a) deep-seated infiltrate, (b) diffuse infiltrate with thick hypopyon, (c) total infiltrate, and (d) localized infiltrate with thinning

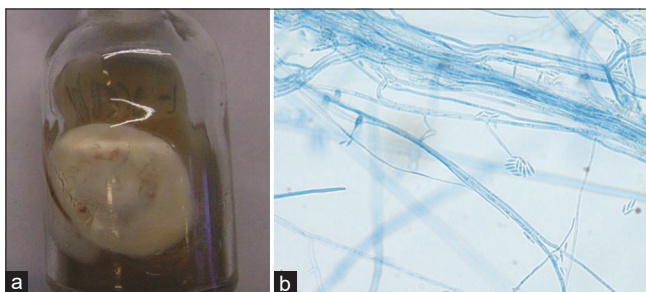


Figure 2: (a) Off white, velvety fungal colony with pinkish tinge (Sabouraud dextrose agar, 25°C, 7 days). (b) Tiny, single-celled, oval microconidia in clumps on the tip of tapering phialides. Thin, septate, hyaline hyphae are seen in fascicular bundles

Table 2: Univariate and multivariate logistic regression analyses

Logistic regression predicting visual acuity: <20/60 (final) versus ≥20/60 (good vision)	Crude OR (95% CI)	Crude P	Adjusted OR (95% CI)	P
Age >50 years (yes vs. no)	3.39 (1.05-10.95)	0.041	4.08 (0.95-17.53)	0.059
History of trauma (yes vs. no)	0.98 (0.33-2.97)	0.975	1.15 (0.28-4.83)	0.845
Treatment delay (>15 days) (yes vs. no)	13.8 (3.3-57.67)	<0.001	15.1 (2.93-77.89)	0.001
Infiltrate area (>20 mm ²) (yes vs. no)	1.67 (0.53-5.2)	0.379	0.64 (0.13-3.07)	0.573
Presence of hypopyon (yes vs. no)	3.85 (1.19-12.47)	0.025	2.57 (0.6-11.03)	0.203

CI=confidence interval, OR=odds ratio

b. *Interpretation for multivariate regression:* In multiple logistic regression, only treatment delay >15 days was significant to predict poor vision of <20/60 (OR: 15.1 and $P = 0.001$). In other words, fixing other covariates, a treatment delay of >15 days was found to be 15 times more risk for poor vision (<20/60) compared to a treatment delay of ≤15 days [Table 2].

Discussion

The members of the ubiquitous genus *Acremonium* belong to the family Hypocreaceae.^[14] They are environmental saprophytes and are found in soil and dead decaying plant materials. The genus contains about 150 species. Most of them are opportunistic pathogens, causing surface infections in humans such as infections of the respiratory system, nails, and eyes. In most cases, infections due to *Acremonium* spp. follow a history of ocular trauma with infected vegetable matter. The identification and diagnosis of the causative agents in culture are done with the help of microscopic morphology and colony characteristics. Most of the species are fast growing, and they are compact and moist at the initial stage and mature within 5 days at 25°C. They grow well on modified SDA (i.e., SDA without cycloheximide). The colonies are described as white, powdery, suede-like or smooth, waxy, velvety colonies.^[15] The color of these colonies can be either white, gray, or rose. The *Acremonium* spp. can be studied according to their morphology, but sometimes it becomes difficult to distinguish them from *Fusarium* species because they are almost identical to each other and they share common characteristics. The fungal keratitis caused by *Fusarium*, *Aspergillus*, and *Candida* is frequent and reported well in literature. A study from South America showed that fungi contributed to 26% of culture-positive cases, of which *Acremonium* accounted for 40% of all fungal cultures, followed by *Fusarium* (15%). In the present study of 13 years duration, out of a total of 1605 diagnosed cases of fungal keratitis, *Acremonium* contributed to 65 cases (4.05%).^[5]

The most common risk factor predisposing to *Acremonium* keratitis is trauma with vegetative matter leading to direct inoculation of contaminated material, thus leading to keratitis. This is commonly seen in tropical countries, especially in developing countries where agriculture is the primary occupation. Ocular traumas, commonly with wood or vegetable matter penetration in the cornea, have been reported in most of the published literature.^[10] In our study, a history of trauma was present in 32 cases (49.2%), out of which vegetative matter injury constituted 13 cases. Zbiba et al.^[16] have reported a rare case of *Acremonium* keratitis following windstorm exposure. The case was managed initially with topical and systemic voriconazole, followed by collagen crosslinking for stromal necrosis and

finally a penetrating keratoplasty. Other risk factors which have been reported are previous use of steroids or long-term broad-spectrum antibiotics, poor ocular surface, reduced corneal sensation, lagophthalmos, and contact lens use, especially for prolonged hours.^[17] Simmons et al.,^[18] in 1986, isolated *Acremonium* along with other fungi in extended contact lenses, especially those with higher water content. Surgical procedures such as cataract surgery may cause suppression of systemic and local immunity, thereby facilitating the growth of opportunistic infections. Delayed-onset clustered endophthalmitis has been reported in four patients within 4 weeks of cataract surgery.^[19] The culture from the reservoir-type humidifier in the operating room grew *Acremonium kiliense* identical to the samples obtained from the patients. In our study, we had two patients who had undergone cataract surgery in the recent past and developed keratitis soon after. Rao et al.^[20] have published a case report on *Cephalosporium* endophthalmitis, 7 weeks following penetrating keratoplasty with unfavorable outcomes even with amphotericin and primaricin treatment, resulting in the need for enucleation. Psoriasis leading to frequent ocular inflammation has also been found to be associated with *Acremonium* keratopathy.^[21] *Acremonium* has also been isolated from operating room walls, furniture, and vents causing keratitis in patients following the LASIK procedure.^[7] Although not specific to *Acremonium*, previous studies have detected that local (neurotrophic conditions like Hansen's, lagophthalmos) and systemic immunosuppressed states (diabetes and tuberculosis) also make the cornea prone to developing bacterial and fungal keratitis.^[22-24] Liu et al.^[25] have reported *Acremonium* keratitis in an 86-year-old Sjogren patient who was on systemic azathioprine and developed recurrence on the 76th day after therapeutic keratoplasty, thereby emphasizing the role of systemic immunosuppression and local postoperative steroid use as a causative factor. In our study, two patients were diagnosed with tuberculosis and Hansen's disease each and were already undergoing treatment for the same while developing keratitis. One patient also had Bell's palsy with lagophthalmos, for which tarsorrhaphy was performed to facilitate healing.

The average size of infiltrate in our study was 8.2 mm (longer meridian) and 4.9 mm (shorter meridian) with a range from 1 to 11 mm. The characteristic clinical picture of fungal keratitis, such as dry-looking, elevated ulcer with hyphate edges, was observed only in 10 eyes. This may be because 86.1% of our patients were on previous treatment of which antifungals constituted 50%, which may have contributed to the alteration of the ulcer morphology. *Staphylococcus* was found to be the most common coexisting pathogen in 22 cases (33.8%). Previous studies by Alkatan et al.^[26] and Pate et al.^[27] have also shown the coexistence of bacteria especially *Staphylococcus*, in 28.7% and 19.7% respectively. Management varied depending on the size,

Table 3: Comparison of surgical intervention of various fungal keratitis

Different fungi	Surgical management (%)	Therapeutic keratoplasty	Tissue adhesive	Evisceration	IOAB, AC wash, superficial keratectomy
All fungi ^[28] (n=1360)	50.8	321 (23.6%)	257 (18.9%)	113 (8.3%)	----
<i>Fusarium</i> spp. ^[30] (n=47)	48.9	9 (19.1%)	15 (31.9%)	2 (4.2%)	4 (8.5%)
Dematiaceous fungal keratitis ^[31] (n=15)	100	4 (26.6%)	2 (13.3%)	----	9 (60%)
<i>Acremonium</i> spp. (present study) (n=65)	32.3	15 (23%)	6 (9.2%)	----	5 (7.6%)

AC=anterior chamber

depth of infiltration, and proximity to the limbus. Ulcers that were smaller, superficial, and away from the limbus were treated with only topical natamycin eye drops. Deeper (posterior one third), larger (>6 mm), and limbus invading ulcers were supplemented with systemic azoles (mostly ketoconazole) after baseline liver function tests. Mixed infection was treated with antibiotics, that is, fluoroquinolones.

Among the 54 patients who followed up regularly, 63% (n = 34) resolved well with scar formation. Despite medical management, about 32.3% (n = 21 eyes) of cases warranted surgical intervention in the form of AC wash, intrastromal injection (voriconazole), therapeutic keratoplasty, intravitreal injections (amphotericin B), and pars plana vitrectomy. A study by Gopinathan *et al.*^[28] observed that fungal infection contributed to 38.2%, out of which *Fusarium* was the most common (36.6%). About 46.6% of these patients needed surgical intervention. Eyes with fungal keratitis (50.8%) required more surgical intervention than those having a bacterial infection (43.2%). Previous studies on fungal keratitis caused by *Aspergillus* and *Fusarium* primarily have reported resolution with scarring observed in 35.6%, whereas surgical interventions like tissue adhesives, therapeutic keratoplasty, and evisceration were required in 18.9%, 19.7%, and 3.4%, respectively.^[29] In a study from our institute on *Fusarium* keratitis, 48.9% required surgical intervention [Table 3].^[30,31]

Out of 15 cases which underwent keratoplasty, a favorable primary outcome, that is, no recurrence and complete resolution of infection, was seen in 11 cases (73.3%). Of the remaining four cases, recurrence of infection was seen in three eyes and new bacterial infection in one eye. One eye developed secondary glaucoma postoperatively. Age of patients > 50 years and delay in initiation of treatment beyond 15 days were found to be poor predictors for final visual outcome. Mundra *et al.*^[32] have reported complete eradication of fungal infection following penetrating keratoplasty in 89.9% and recurrence in 10.1%. Anatomical restoration was accomplished in 97%. A study from China where keratoplasty was performed for fungal keratitis reported a similar success rate with clear grafts (79.6%), recurrence (7.4%), corneal graft rejection (29.6%), secondary glaucoma (1.9%), and cataracts (4.6%).^[33]

Various studies have proved the role of antifungals like amphotericin B, natamycin, and fluconazole in the management of *Acremonium* keratitis.^[15] In our study, natamycin alone was sufficient to treat 20 eyes (37%). Other antifungals that were also used in our patients (32 eyes, 49.2%) were ketoconazole (n = 23), itraconazole (n = 8), and fluconazole (n = 1) in oral form and amphotericin B injection intravitreally (n = 4). Voriconazole was administered in the form of intrastromal, intracameral injection (n = 1) and at the end of all keratoplasty procedures (n = 15). Of late, voriconazole has

been available commercially as an eyedrop in India. Earlier, it used to be formulated from systemic preparations, which have a limited shelf-life. Hence, it was not used as a primary drug of management in most of our patients. Natamycin is effective in the treatment of fungal keratitis including *Acremonium*. Newer agents like voriconazole and posaconazole have also been found to have favorable *in vitro* activity against *Acremonium* spp.^[34] Cretì *et al.*^[21] have reported a case successfully treated by using voriconazole, which has a broad spectrum of activity along with good penetration into aqueous and vitreous.

Few of our cases that developed posterior segment involvement as evident on the B scan were treated with intravitreal amphotericin B with or without pars plana vitrectomy. In advanced or nonresponding cases, keratoplasty proved to be a viable option in decreasing the fungal load and resulting in the resolution of keratitis. Collagen crosslinking has also been reported to be effective in managing the refractory case.^[35] In our series, collagen crosslinking was not offered to any of our patients as a treatment modality.

Polymicrobial infections, that is, the coexistence of fungus and bacteria are not uncommon. There have been case reports where *Acremonium* has been found coexistent with *Stemphylium* species^[17] and with previous history of herpetic keratopathy.^[36] In our series, there was evidence of coexistence with *Staphylococcus*, *Pseudomonas*, *Corynebacterium*, and coagulase-negative *Staphylococcus*, for which antibiotics in the form of fluoroquinolone were prescribed wherever required as mentioned before. Topical fluoroquinolones along with topical natamycin were prescribed in nine out of 29 eyes (13.8%). The remaining patients either grew significant bacterium in culture noticed on subsequent visits or were already responding to antifungals only. Thus, only antifungals were continued. Surgical management was needed in four eyes [Tissue Adhesive (TA) + Bandage Contact Lens (BCL), Therapeutic Penetrating Keratoplasty (TPK), Parsplana Vitrectomy (PPV)]. Among these nine cases, scarring (two eyes), failed graft (one eye), clear graft (one eye), and phthisis bulbi (one eye) were observed. A vision of better than 20/200 was observed in four eyes (44.9%). Polymycotic infection was seen in two eyes, where yeast (*Candida*) was identified.

Conclusion

There has been previous mention of *Acremonium* spp. In the literature, mostly in small case series and case reports. This is the largest series of keratitis caused by *Acremonium* spp., which describes the risk factors, clinical characteristics, management modalities, and outcome in 65 cases over 13 years. Our data shows that cases that presented early with not-so-advanced infiltrate responded well to natamycin monotherapy.

However, our data cannot ascertain the most effective drug against *Acremonium* keratitis. There are currently no standard therapies suggested because of low incidence and poor correlation between *in vitro* susceptibility and clinical response. Management can be tailored based on the clinical presentation, course, and response to treatment. Public health-care policies should be directed toward patient education, prevention, and prompt treatment of infectious keratitis. Self-medications should be discouraged, especially corticosteroids. The limitations of the study are its retrospective noncomparative nature, loss to follow-up of a few cases, and identification which was based on morphology and not sequencing and, therefore, confined to genus level only.

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Conflicts of interest

There are no conflicts of interest.

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