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Original Research Article

The outcome of microbiologically proven fungal keratitis following standard treatment protocol

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A B S T R A C T

Purpose: To describe the baseline characteristics, microbiological spectrum, therapy and assess the visual outcome in patients proven with fungal keratitis following standard treatment protocol.
Materials and Methods: This longitudinal study was reviewed all patients with culture-proven fungal keratitis over a year at a tertiary referral facility in Bangladesh. All of the patients who had corneal stromal infiltrates had their corneal scrapings subjected to the normal microbiologic examination process, as well as a smear and culture-guided antimicrobial medication.
Results: Epidemiological features of patients (n=100), the mean age of patients was 55.6±9.8 years. More in the age group 51 to 60 years (28%). Males were more predominant (67%), commonly come from rural areas (59%). More were agriculture in workers (57%). Predisposing factors in fungal keratitis were trauma with vegetative matter (58%), herpetic keratitis (16%), penetrating keratoplasty (10%), extended wear of contact lens(12%), LASIK(4%). Treatment taken by another ophthalmologist before the presentation (46%). Low vision (20/50 to 20/160) was found in 58% cases and legal blindness (20/200 to worse) was 40% of cases on visual acuity test at presentation. Filamentous Aspergillus (68%), Fusarium (2%), Scedosporium species (6%) and Candida(20%) were found by doing culture. Surgical intervention was needed in 36% of cases with topical and systemic anti fungal medications for management. Visual acuity after treatment was 20/40 or better in 16% of cases, low vision (20/50 to 20/160) in 39% of cases and legal blindness (20/200 to worse) in 45% of cases.
Conclusion: Fungal keratitis causes irreparable vision damage. Yeast infections were less common than infections with filamentous fungus, which were typically treated more aggressively through both medicinal and surgical means. Similar durations of infections and visual results were observed in filamentous and yeast keratitis. In 80% of the cases where it was done, antifungal susceptibility testing had an impact on the course of treatment.

1. Introduction

A major contributor to microbial keratitis, fungal keratitis is frequently diagnosed later, presents with more severe infections, responds to therapy more slowly, and has worse visual outcomes than bacterial infections.[1] Geographical factors have a significant impact on the occurrence of fungal keratitis; in tropical regions, it is thought to account for more than half of all corneal ulcers that have been proven by culture, but it is still quite uncommon in temperate regions.[1–3] Similar to how the causal organisms differ regionally, yeast is more prevalent

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in temperate regions whereas filamentous species like Fusarium and Aspergillus predominate in tropical latitudes. While filamentous infections are more likely to occur after ocular trauma, particularly in eyes with preexisting ocular surface illness and lower host immunity, yeast keratitis has been proven to be more common in these eyes.[4,5] Even in regions where fungus infections are relatively uncommon, clinical suspicion is essential for prompt diagnosis. Excision of contaminated tissue may be required to control infection, however, because medical therapy aimed at the most abundant organisms in a given region is not always successful due to delayed diagnosis and poor response to medication.[4–6] Given the recent advent of drug resistance, susceptibility testing may prove crucial in guiding therapy, particularly in cases of severe or recalcitrant infections. However, testing is rarely frequently performed and region-specific antifungal susceptibility data are scarce.[7] In this retrospective chart analysis, our goal was to assess the results of patients who received one-year treatment at a single-site, tertiary care academic medical center for culture-proven fungal keratitis.

2. Materials and Methods

This longitudinal study included all patients with microbial keratitis who had a positive corneal culture for fungi in the time of 01 July 2021 to 30 June 2022 in Ispahani Ispahai Islamia Eye Institute& Hospital, Dhaka, Bangladesh. At each clinic visit, information about microbiology and pathology, demographics, medical and ophthalmological histories, intraocular procedures and surgeries, diagnostic tests, and medications (including dosage, frequency, and mode of administration) all were evaluated. The presence of hypopyon and the highest-available visual acuity were both confirmed by ophthalmologic tests. Potential risk factors for fungal keratitis such as ocular surface illness, prior ocular operations, contact lens use, ocular trauma, length of symptoms before presentation at our institution, and treatments obtained before presentation were recorded as baseline characteristics.[7,8] At every subsequent appointment as well as when the patient was first presented, the best visual acuity (VA) was noted. For statistical analysis, the visual acuity thresholds for legal blindness (20/200 or worse) and low vision (20/50 to 20/160) were employed. Topical and systemic therapies that were carried out at our facility were documented. Antibiotics and operations such as evisceration, penetrating keratoplasty, and conjunctival hood. Time from the collection of cultures to the last follow-up was used to define the follow-duration. Time to resolution was calculated as the number of days between the collection of the culture and the initial visit at which the absence of the infiltrate was confirmed by a clinical examination. The Statistical Package for Social Sciences (SPSS) application version 24 was used for the statistical analysis of both quantitative and qualitative data (USA).

3. Results

Over the study period, a total of 108 eyes from 100 patients had a positive corneal culture for a fungal organism, of which, 100 eyes were treated for fungal infection and included in this study. Eight instances were eliminated because the ulcer responded to therapy with solely antibacterial drugs and the treating ophthalmologist assessed the fungus to be a contaminant in those situations. Table 1 showed the Epidemiological features of patients (n=100), the mean age of patients was 55.6±9.8 years. More in the age group 51 to 60 years (28%). Males were more predominant (67%), more in Rural areas (59%). More were agriculture in workers (57%). Table 2 showed : 58 out of 100 patients (58%) had trauma with vegetative matter associated with the development of fungal keratitis. A history of recent ocular trauma, history of ocular surface disease, history of ocular surgery, history of eye infections, and use of contact lenses was among the ocular risk factors. Predisposing factors in fungal keratitis were H/O herpetic keratitis (16%),H/O penetrating keratoplasty (10%), H/O extended wear of contact lens(12%), H/O LASIK(4%). Table 3 showed: Before presenting to our institution, 46% of patients had been evaluated by an ophthalmologist and 32.8% by other than an ophthalmologist 23%. Table 4 showed Visual acuity at presentation low vision (20/50 to 20/160) 58%, Legal blindness (20/200 to worse) 40%.Table 5 showed the fungus responsible for keratitis were filamentous Aspergillus (68%), Fusarium (2%), Scedosporium species (6%), and Candida (20%). Results of susceptibility testing guided the choice of antifungal therapy. Table 6 showed Medical treatment only (64%) & bouth medical and surgical treatment (36%) given. Table 7 showed Visual acuity after treatment of low vision (20/50 to 20/160) in 39%, Legal blindness (20/200 to worse) in 45%.

Table 1: Epidemiological characteristics of patients

Demographics	Indicator	No. (%)
Age	Mean± SD	55.6 ± 9.8 years
Age group(in years)	< 10	0
	11-20	0
	21-30	10 (10)
	31-40	8(8)
	41-50	21(21)
	51-60	28 (28)
	61-70	26(26)
	>70	7(7)
Gender	Male	67(67)
	Female	33(33)
Residence	Urban	41(41)
	Rural	59(59)
Occupation	Agriculture	57(57)
	Others	43(43)

Table 2: Predisposing factors in patients for fungal keratitis (n=100)

Predisposing factors	Frequency	Percentage %
Trauma with vegetative matter	58	58
H/O herpetic keratitis	16	16
H/O penetrating keratoplasty	10	10
H/O extended wear of contact lens	12	12
H/O LASIK	4	4

Table 3: Management prior to/at presentation (n=100)

Management prior to/at presentation	Frequency	Percentage %
Seen by outside ophthalmologist	46	46
Seen by a provider other than ophthalmologist	23	23
Topical anti-bacterial	69	69
Topical anti-fungal	55	55
Systemic anti-fungal	19	19

Table 4: Visual acuity at presentation by Snellen's chart (n=100)

Visual acuity	Frequency	Percentage %
20/40 or better	2	2
Low vision (20/50 to 20/160)	58	58
Legal blindness (20/200 or worse)	40	40

Table 5: Type of fungus responsible for corneal ulcers (n=100)

Type of Fungus	Frequency	Percentage %
Filamentous	80	80
Aspergillus	68	68
Fusarium	2	2
Scedosporium species	6	6
Curvularia species	2	2
Epicoccum species	2	2
Yeast	20	20
Candida	20	20

Table 6: Treatment of fungal corneal ulcer (n=100)

Treatment	Frequency	Percentage %
Topical Plus systemic antifungal		
Natamycin +Amphotericin +cotrimazole ointment +ketoconajole tablet	80	80
Fluconazole+Amphotericin +cotrimajole ointment+ Fluconajole tablet	20	20
Surgical intervention		
Conjunctival hood+ Tenon patch graft	12	12
Conjunctival Hood	16	16
Therapeutic Penetrating Keratoplasty	8	8

Table 7: Visual acuity after treatment by Snellen's chart (n=100)

Visual acuity	Frequency	Percentage %
20/40 or better	16	16
Low vision (20/50 to 20/160)	39	39
Legal blindness (20/200 or worse)	45	45

4. Discussion

Clinical outcome in microbial keratitis is influenced by several variables, and epidemiological trends vary between countries and within regions of the same nation. To create suitable diagnostic and therapeutic solutions, detailed data is essential.

The majority of cases with microbial keratitis in this series were male (67%) and included both culture-proven cases as well as the overall clinically suspected cases. It is clear why there are more men than women. In this study, outdoor employment was substantially more frequently linked to ocular damage. In a 10-year study by Gopinathan et al., it was discovered that trauma was the etiological component in more than 50% of infected eyes and that males were afflicted 2.5 times more frequently than females.[9]

A quick diagnosis is made possible by direct microscopic examination of corneal scrapings, which also serves as the foundation for the initial antimicrobial therapy that may subsequently be adjusted in response to culture results. As a result, obtaining an ideal treatment result depends on a precise smear diagnosis.

Similar to those previously reported, predisposing risk factors existed for filamentous keratitis as opposed to yeast keratitis. Even though research on fungal keratitis in tropical regions where filamentous keratitis predominates has shown a high correlation with ocular damage, especially with plant matter.[10,11] According to these data, Bharathi et al. noticed in a retrospective analysis that the South Indian harvest season, between June and September, saw the highest prevalence of fungal keratitis cases with culture-proven cases. They found that 61% of cases of fungal keratitis were caused by a herbal drug, and 92% of patients suffered ocular damage.[12]

The majority of the patients in our study had a legal blindness threshold of 20/200 or lower. Forty percent of those with fungal keratitis received treatment. The final visual acuity for 16% of patients who underwent treatment for fungal keratitis was 20/40 or better, while the remaining patients had a visual acuity of 20/50 or worse. The severity and greater prevalence of filamentous keratitis compared to yeast keratitis, as well as significant predictors of worse visual results, were all investigated as probable explanations for these poor visual outcomes.[13,14] We also considered the value of susceptibility testing.

When compared to yeast keratitis, filamentous keratitis is more likely to be treated aggressively, as shown by the use of numerous topical treatments and/or systemic and intraocular antifungal drugs. Although the ultimate VA was comparable between the two groups, more eyes in the filamentous keratitis group experienced PK, underwent enucleation, or lost their ability to perceive light. The prolonged period of infection before culture suggests a delayed diagnosis and potentially a more severe infection at the time of referral, which is one explanation. Treatment for patients with filamentous keratitis must be aggressive and started as soon as possible because these individuals have worse visual out comes.[13–15]

Perforation and/or therapeutic keratoplasty were more frequent in fungus, despite the correlation not reaching statistical significance. A VA of 20/200 or worse at presentation among all patients with fungal keratitis was a significant predictor of an ultimate VA worse than 20/40. This was probably due to the infection has advanced to a severe stage at which time therapies were less effective. Low VA patients should begin vigorous treatment as soon as possible since they run a higher risk of experiencing negative visual results.

In comparison to Lalitha et alstudies, the differences in using susceptibility between Fusarium and Aspergillus species were similar in our investigation.[16] However, in contrast to our study, Lalitha et alstudy, 's which had a considerably bigger sample size, also looked into the susceptibility of fungal agents to several drugs like Natamycin and Itraconazole.

The small patient population were the most important shortcomings in this study. There was no standardized way to record risk factors or perform a clinical assessment because the data was gathered as part of routine clinic appointments. The baseline VA for several of the patients was unavailable, making it impossible to analyze how fungal keratitis affected vision loss.

5. Conclusions

Despite its flaws, our study offers trustworthy early data on this topic, demonstrating that filamentous fungi are the primary cause of fungal keratitis brought on by agricultural activity and related eye injuries. Since corneal infections must be identified quickly to prevent permanent vision loss by facilitating full recovery, the characteristics of fungal keratitis cases described in this retrospective review may be helpful in the early diagnosis of the disease and initiating appropriate early empirical treatment by clinicians working in this region. We recommend and encourage other researchers to conduct more studies about clinical investigations of fungal keratitis, its proper management & finally good visual outcome.

6. Conflict of Interest

None.

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