

ETIOLOGICAL DIAGNOSIS OF MICROBIAL KERATITIS IN A TERTIARY CARE HOSPITAL

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Abstract

Background: Microbial keratitis is a serious cause of ocular morbidity in India second only to cataract. The etiological and epidemiological features of Infective keratitis depend on host factors, geographical location, and climate also tends to vary with time. Present study was aimed to study etiological diagnosis of microbial keratitis in a tertiary care hospital. **Material and Methods:** Present study was prospective, observational hospital-based study, conducted in patients of any age/gender, clinically diagnosed with microbial keratitis. **Results:** Among 44 patients, majority were from age group of 41-60 years (34.09 %) & male to female ratio of 3.4:1 Predisposing and associated risk factors noted were trauma (77.27 %), previous medications (topical steroid/ topical antibiotic + steroid combinations) (22.73 %), diabetes mellitus (20.45 %), exposure keratopathy (6.82 %), chronic dacryocystitis (4.55 %) & recurrent conjunctivitis (2.27 %). Patients had history of, patients were using either topical steroid or topical steroid and antibiotic combinations (18.92%) and patient was using systemic steroid (2.7%). In majority of patients vision of hand movement with intact perception of light (PL) and Projection of rays (PR) (29.55 %) was noted followed by visual acuity between 6/9-6/18 (27.27 %) and only 1 patient had No PL at the time of presentation. On detailed examination, common ulcer location was paracentral (47.73 %) & central (34.09 %). Majority had corneal ulcer of size > 3 mm (50 %), involved <50% of the corneal stromal depth (63.64 %). Hypopyon was present in 13.64 % of patients. Corneal sensation was absent in 17 patients (38.64 %). Corneal scraping was done in all patients, culture positivity rate was 56.82 %, fungal growth was seen in 10 patients (22.73 %) & bacterial growth was seen in 15 patients (34.09 %). **Conclusion:** Trauma, previous ophthalmological medications, diabetes mellitus, exposure keratopathy were common etiologies observed for microbial keratitis.

INTRODUCTION

Microbial keratitis is a serious cause of ocular morbidity in India second only to cataract. It assumes a greater importance in pediatric population because of risk of irreversible ocular sequelae like visual deprivation or amblyopia.^[1,2] Bacterial keratitis is a potentially devastating ocular infection that may occur when the corneal epithelial barrier is compromised due to injury or trauma, leading to ulceration and infiltration of inflammatory cells.^[3]

Keratitis rarely occurs in the normal eye because of the cornea's natural resistance to infection. However, predisposing factors such as trauma, contact lens wear, dry eyes, ocular surface disorders, and immune suppression may alter the

defense mechanism of the outer eye and permit bacteria to invade the cornea.^[4]

Even though most community-acquired corneal ulcers are resolved with appropriate treatment, severe infections may result in acute perforation, scleritis, or endophthalmitis, or lead to blinding sequelae such as secondary glaucoma, corneal scarring, corneal perforation, or phthisis bulbi.^[5] The etiological and epidemiological features of Infective keratitis depend on host factors, geographical location, and climate also tends to vary with time.^[6] Present study was aimed to study etiological diagnosis of microbial keratitis in a tertiary care hospital.

MATERIAL AND METHODS

Present study was prospective, observational hospital-based study, conducted in department of ophthalmology, at JIU's Indian Institute of Medical Science & Research, Warudi, Tq. Badnapur, Dist: Jalna, India. Study duration was of 2 years (January 2021 to December 2022). Study was approved by institutional ethical committee.

Inclusion Criteria

- Patients of any age/gender, clinically diagnosed with infectious keratitis, Willing to participate in present study

Exclusion Criteria

- Patients with impending perforating or perforated corneal ulcer.
- Patients who are unwilling to participate in the study.

Study was explained to patients in local language & written consent was taken for participation & study. Demographic & clinical data was recorded in case record proforma. Detailed history including onset, duration and associated risk factors, medical comorbidities were noted. General, systemic & ophthalmic examination findings were noted. Distant vision of patient was tested with Snellen's chart and Landolt's C chart. Detailed anterior

segment examination was done on Slit-lamp, corneal ulcer characteristics such as size, depth, location, margins, floor, infiltration, vascularization and fluorescein staining of cornea were noted. Corneal sensation was checked with a cotton wisp. Sac patency was checked by Sac syringing under topical anesthesia.

Microbiology evaluation was done by corneal scraping performed on a slit lamp under topical anaesthesia with No. 15 Bard Parker surgical blade from the edge and base of the ulcer. Scraping material plated on 2 slides and sent for Gram and 10% KOH staining and directly inoculated on Blood agar, Chocolate agar and Sabouraud agar for culture.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS

In present study, 44 patients with corneal ulcer were included. Majority were from age group of 41-60 years (34.09 %) followed by age group of 21-40 years (29.55 %). Majority were males (77.27 %) & male to female ratio of 3.4:1.

Table 1: General characteristics

	No. of patients	Percentage
Age groups (in years)		
≤ 20	5	11.36
21-40	13	29.55
41-60	15	34.09
61-80	11	25
>80	0	0
Mean age (mean±SD)		
Gender		
Male	34	77.27
Female	10	22.73

Common clinical features observed were pain (97.73 %), redness (97.73 %), blurred vision (77.27 %), discharge (75 %), photophobia (70.45 %) & itching (47.73 %).

Table 2: Clinical features

Clinical features	No of Patients	Percentage
Pain	43	97.73
Redness	43	97.73
Blurred Vision	34	77.27
Discharge	33	75
Photophobia	31	70.45
Itching	21	47.73

Predisposing and associated risk factors noted were trauma (77.27 %), previous medications (topical steroid/topical antibiotic + steroid combinations) (22.73 %), diabetes mellitus (20.45 %), exposure keratopathy (6.82 %), chronic dacryocystitis (4.55 %) & recurrent conjunctivitis (2.27 %). Patients had history of, patients were using either topical steroid or topical steroid and antibiotic combinations (18.92%) and patient was using systemic steroid (2.7%). In 6 patients (13.62 %), there were no predisposing factors or associated risk factors noted.

Table 3: Risk Factors

Risk factors	No of Patients	Percentage
Trauma	34	77.27

Trauma With Vegetative Matter	21	
Trauma With Other Than Vegetative Matter	13	
Topical steroid/ Topical Antibiotic + Steroid Combinations	10	22.73
Diabetes Mellitus	9	20.45
Exposure Keratopathy	3	6.82
Chronic Dacryocystitis	2	4.55
Recurrent Conjunctivitis	1	2.27

In our study, all patients had unilateral involvement of eyes. In majority of patients vision of hand movement with intact perception of light (PL) and Projection of rays (PR) (29.55 %) was noted followed by visual acuity between 6/9-6/18 (27.27 %) and only 1 patient had No PL at the time of presentation. On detailed examination, common ulcer location was paracentral (47.73 %) & central (34.09 %). Majority had corneal ulcer of size > 3 mm (50 %), involved <50% of the corneal stromal depth (63.64 %). Hypopyon was present in 13.64 % of patients. Corneal sensation was absent in 17 patients (38.64 %).

Table 4: Ophthalmological examination findings

Ophthalmological examination findings	No of Patients	Percentage (%)
Visual Acuity		
<6/9	2	4.55
6/9 - 6/18	12	27.27
6/24 - 6/60	11	25
Finger Count 1Meter – 6Meter	5	11.36
HM PL+ PR Accurate	13	29.55
NO PL	1	2.27
Location of Corneal Ulcer		
Paracentral	21	47.73
Central	15	34.09
Peripheral	4	9.09
Paracentral + Peripheral	2	4.55
Limbal To Limbal	2	4.55
Corneal Ulcer Size (mm)		
> 3 MM	22	50
≤ 3 MM	13	29.55
Limbal to Limbal	2	4.55
Stromal depth of corneal Ulcer (%)		0
<50%	28	63.64
>50%	14	31.82
Not Appreciable	2	4.55
Hypopyon		0
Present	6	13.64
Absent	36	81.82
No view of anterior chamber	2	4.55
Corneal Sensation		
Present	15	34.09
Reduced	12	27.27
Absent	17	38.64

Corneal scraping was done in all patients, culture positivity rate was 56.82 %, fungal growth was seen in 10 patients (22.73 %) & bacterial growth was seen in 15 patients (34.09 %). Majority of bacterial isolates were of gram positive bacteria such as *staphylococcus aureus* (33.33 %), *coagulase negative staphylococcus* (26.67 %), *streptococcus pneumonia* (13.33 %) & *other streptococcus* (6.67 %), while only gram negative bacteria isolated was *pseudomonas* (20 %). Among fungal isolates organisms noted were *fusarium* species (40 %), *fusarium. soloni* (20 %), *fusarium oxysporum* (10 %), *f. dimerium* (10 %), *aspergillus fumigata* (10 %) & *trichophyton* species (10 %).

Table 5: Culture findings

Culture Findings	No of Patients	Percentage (%)
Culture positives	25	56.82
• Bacterial	15	34.09
• Fungal	10	22.73
Culture negatives	19	43.18
Bacterial Results (n=15)		
Gram Positive Bacteria		
• Staphylococcus aureus	5	33.33
• Coagulase Negative staphylococcus	4	26.67
• Streptococcus pneumonia	2	13.33
• Other streptococcus	1	6.67

Gram Negative Bacteria		
• Pseudomonas	3	20
Fungal Isolates (n=10)		
• Fusarium species	4	40
• Fusarium. Soloni	2	20
• Fusarium. oxysporum	1	10
• F. Dimerium	1	10
• Aspergillus Fumigata	1	10
• Trichophyton Species	1	10

DISCUSSION

Microbial keratitis is defined as loss of the corneal epithelium, with underlying stromal infiltration and suppuration associated with signs of inflammation with or without hypopyon. Microbial keratitis is an ocular emergency that requires prompt diagnosis and appropriate management to ensure the best visual outcome for the patient.^[2]

It presents clinically with pain, photophobia, redness, infiltration, corneal edema, corneal ulceration, and anterior chamber reaction. If left untreated, it can lead to endophthalmitis and even corneal perforation and blindness.⁸ Active corneal infection triggers inflammatory and immune responses to preserve ocular integrity, which may lead to loss of transparency and regularity of cornea, visual acuity decreases in a large percentage of cases due to corneal scars.^[2]

In study by Paty BP *et al.*,^[10] out of 45 patients, 35 were males. Majority of the patients belonged to age group of 50-60 years. Pain, Redness, Hypopyon was most commonly seen in Bacterial keratitis. In Fungal Keratitis, Redness (80%), Blurred vision (80%) was seen. Most common occupation was Farmers (66.6%). Trauma was the most common risk factor (23 isolates). Majority were bacterial isolates (29 isolates, 64.4%) followed by fungal (5 isolates, 11.1%). Predominant isolate was *Staphylococcus aureus* (68.9%). All the gram- positive isolates showed 100% sensitivity to Linezolid and Vancomycin.

Puri LR^[11], conducted a retrospective clinical study among 1897 subjects with microbial keratitis, majority of subjects (71.2%) belonged to the age group of 26 to 55 years (71.2%), presented after two weeks (82.3%) and used non-prescription eye drops (71.9%) before visiting to the eye hospital. Ocular trauma (54.5%) was the most commonly reported predisposing factor. The central and paracentral ulcers comprised of 72.8% of ulcers with size greater than 2mm in 2.7% and moderate ulcer in 71.1%. Microbiological test revealed fungal ulcers in 78.1% subjects. Presenting visual acuity better than 6/18 was reported in 7% only.

Augustin JB^[12] studied 120 cases, a total of 27 cases were culture positive. 17.5% were bacterial, 5% were polymicrobial and 18.34% were fungal. Among bacterial aetiology, *Pseudomonas aeruginosa* was most common 33.34% followed by Coagulase negative *Staphylococcus*-22.23% and

Streptococcus pneumoniae-18.51%. Trauma was the major risk factor. Diabetes mellitus, contact lens usage, exposure keratitis were the other comorbidity / risk factors. Out of the total 27 culture positive bacterial corneal ulcer cases none healed completely, 77.78% improved clinically with opacity and 22.22% ended with recurrence/complications.

Acharya M *et al.*,^[13] studied 625 patients, 68.2% were male and 31.8% were female. The age group affected most was the sixth decade; 21.9% (137 cases). Trauma was the most common associated risk factor in 151 cases (24.2%) followed by previous ocular surgery in 111 (17.8%). Out of the 625 corneal scrapings, 393 (62.9%) were culture-positive. Bacterial culture accounted for 60.6% (238/393) and fungal cultures were 143 (36.4%). More than 50% of the bacterial keratitis cases and more than 60% of the fungal cases had a favorable outcome. *Staphylococcus sp.* and *Fusarium sp.* were the most common bacteria and fungus isolated, respectively. Only one-third of the cases required surgical intervention, and the remaining two-thirds were managed medically.

Pre-existing dry eye disease, blepharoconjunctivitis, corneal perforation, recent trauma or surgery, immunosuppression and local or systemic steroid therapy have all been identified as risk factors of progression to endophthalmitis in initially corneal infections.^[14] Microbial resistance to antibiotic agents is becoming increasingly prevalent in ocular infections. Clinicians should prescribe antibiotic agents only when clearly indicated and should order susceptibility testing whenever possible to prescribe the most appropriate agent.^[15]

For prevention & treatment of microbial keratitis, important areas to target are, improved access to timely and effective medical treatment for this condition; improving patient awareness of the disease and available eye care services, educating the community health workers who provide initial treatment and referral prior to attending the eye hospital, and increasing the affordability and accessibility of available treatment.

CONCLUSION

Trauma, previous ophthalmological medications, diabetes mellitus, exposure keratopathy were common etiologies observed for microbial keratitis.

Prompt diagnosis and specific treatment according to the etiological agent is the best path to a better visual prognosis.

Conflict of Interest None to declare

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