Exploring the Spectrum of Microbial Keratitis: A Comprehensive Study at a Tertiary Hospital in Western Maharashtra

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Abstract: *Aim: To assess the different types of microbial keratitis and their morbidity and mortality in patients presenting to the ophthalmology department of a tertiary hospital. Material and Methods: Data was collected from 80 patients by history taking, general examination, ophthalmic examination and Corneal scraping material was sent for microbiology evaluation as per standard guidelines. Result: The study included 80 patients with a mean age of 51.15±15.10yrs, with 66.2 % being male. Sugarcane leaf was found to be the most common agent for trauma in 25.1% of cases, followed by thorn prick in 10.1%, wooden stick in 10.1%, dust in 8.8%, and a tree branch in 7.5%. Others included foreign body, stone, and the tail of a buffalo. Ulcers were most commonly found at the central (55%), peripheral (42.5%), and multiple parts (2.5%) of the cornea. On assessment of the type of ulcer, 30% were due to bacteria, 27.5% were fungal, and 12.5% were viral. Among the gram-positive majority were Staphylococcus aureus, followed by pneumococci, streptococci, and hemolytic streptococcus. Similarly, in gram-negative bacteria, the majority were Pseudomonas aeruginosa, followed by Klebsiella pneumoniae. Conclusion: The present study documents corneal injury as one of the main risk factors associated with infective keratitis. Males were found to be more affected than female individuals. The study documented that bacterial infections were most common, followed by fungal and viral infections.*

Keywords: Cornea, Fungus, Bacterial, Keratitis

1. Introduction

Microbial keratitis' epidemiological pattern varies greatly from country to country and even from region to region.[6,7] The pathogenic organism and causes that lead to corneal ulcer, it must be identified in order to create a comprehensive plan for the diagnosis, treatment, and ultimately prevention of corneal ulcer. In order to consider a prevention programme and implement suitable therapeutic measures, the answers to these questions are essential.[2,5]

This study was to determine the current spectrum of possible pathogens implicated in microbial keratitis as well as the aetiological factors and treatment of this eye-threatening disease. Therefore, an updated review is required to provide clinicians with current data on causative pathogens as well as the aetiological factors and treatment of this eye-threatening disease.

Inclusion Criteria:
Patients with suspected microbial keratitis attending the outpatient department of the ophthalmology department at Krishna Hospital, KIMS, Karad, are included in this study.

Exclusion Criteria:
- Patients not giving consent to be part of the study.
- Non-compliant patient.

2. Material and Methods

Data was collected by history taking, general examination, visual acuity, torch light examination, slit lamp examination, fluoresce in staining, and corneal scraping under topical anaesthesia with 0.5% w/v proparacaine under strict aseptic precautions using an aseptic, sterile Bard Parker blade No.15 from the leading edge and base of the ulcer (scraping as needed). Corneal scraping material was sent for gram and KOH mount examination on slide, culture was performed as per standard guidelines.

Ocular history, visual acuity, torch light examination, slit lamp examination, fluorescein staining, and corneal sensations were assessed, and cases were clinically diagnosed; no corneal scrapings were sent for a laboratory procedure for suspected viral keratitis cases.

In all cases, blood sugar was checked to rule out diabetes mellitus, and routine hemograms were done. Prior to the

arrival of the laboratory culture results, empirical treatment had already begun.

Source of Data:
Patients who visited the outpatient ophthalmology department of a tertiary care facility were the subjects of this study. It ran from November 2017 until March 2019. The institutional ethics committee gave its approval for this work.

Sample size: 80 patients.

3. Results

Table 1: Distribution of patients according to occupation

		Frequency	Percent
Occupation	Carpenter	1	1.3%
	Driver	5	6.3%
	Factory worker	4	5.0%
	Farmer	38	47.6%
	House wife	25	31%
	Mill worker	1	1.3%
	Stone worker	2	2.5%
	Student	4	5.0%

Table 2: Showing the distribution of agents causing the trauma to eye

		Frequency	Percent
Agent of trauma	Branch of tree	6	7.5%
	Dust	7	8.8%
	Foreign body	2	2.5%
	Paddy leaf	3	3.8%
	Stone	4	5.0%
	Sugar cane leaf	20	25.1%
	Tail of buffalo	1	1.3%
	Thorn Prick	8	10.1%
	Wooden stick	8	10.1%

Table 3: Showing the distribution of type of ulcer

		Frequency	Percentage
Type of Ulcer	Bacterial	24	30 %
	Fungal	22	27.50 %
	Viral	10	12.5 %
	No organism isolated	24	30 %
	Total	80	100%

Table 4: Showing the organism isolated in bacterial corneal ulcer

Sr. No.	Bacterial Isolated	No of cases
1.	**Gram Positive bacteria**	
a)	Staphylococcus aureus	9
b)	Pneumococci	3
c)	Streptococci pneumoniae	3
d)	Beta hemolytic streptococcus	1
	Total	16
2.	**Gram negative bacteria**	
a)	Pseudomonas aeruginosa	7
b)	Klebsiella pneumoniae	1
	Total	8
Total		24

Table 5: Showing the Organism isolated in Fungal corneal Ulcer

Sr. No	Name of fungi	No. of cases
1	Aspergillus species	9
2	Fusarium species	6
3	Candida species	2
4	Unidentified	5
Total		22

Table 6: Laboratory methods used for diagnosis of keratitis

Sr. No	Laboratory methods	Bacterial	Fungal
1)	Corneal Scrapings (Total-70)		
a)	Gram staining smear	Positive-28(40%) Negative-42(60%)	-
b)	KOH 10% smear	-	Positive-25(35.71%) Negative- 45(64.28%)

Table 7: Showing the laboratory result of culture sensitivity

SR No.	Type of micro-organisms			
1	Total isolates 46 (65.71%)			46(65.72%)
		Bacterial isolates	24(52.17%)	
2		Fungal isolates	22(47.83%)	
3	No organism isolated			24(34.28%)
4	Total Culture sensitivity			70(100%)

Table 8: Showing the visual acuity status at the end of treatment

Sr. No.	Visual acuity Status ulcer	No. of cases	Percent
1	Vision Improved	41	51.25%
2	Vision maintained	8	10%
3	Vision deteriorated	31	38.75%
	Total	80	100%

Table 9: Showing the complications at the end of treatment

Sr No.	Complication	No. of cases	Percentage
1	Adherent Leucoma	5	6.25%
2	Total Corneal scarring	4	5%
3	Descemetocele	4	5%
4	Secondary Glaucoma	3	3.75%
5	Perforation	3	3.75%
Total		19	23.75%

4. Discussion

In the present study, 80 patients fulfilling inclusion criteria with informed consent were included. The mean age of the patients was found to be 51.15±15.10yrs. The majority of patients were 51–60 years old. Among them, 66.2% were male patients and 33.8% were female patients, with a preponderance of males in the study. On assessment of side of involvement, 48.75% had right eye involvement and 51.25% had left eye involvement. Study done by **L. Bajracharya.et al.[5]** revealed that average age of the individual was 47.9 years and with 53.8% patients were male. Similar results were documented in a study done by **Al-Ghafri et al.[4]** which had shown the mean age of patients was 52.2 years (standard deviation [SD]: ±23.2 years; range: 0.1–89 years).

In our study, sugarcane leaf was found to be the most common trauma agent in 25.1% of cases, followed by a thorn prick in 10.1%, a wooden stick in 10.1%, dust in 8.8%, and a branch of a tree in 7.5%. Others included foreign body, stone, and the tail of a buffalo. Study conducted by **Kumari A et al.**[7] was documented trauma, particularly from vegetal waste, was the most prevalent predisposing factor among farmers living in rural areas. Our study correlated well with **Tewari A. et al.**[8] study that found trauma to be a risk factor for keratitis in 90% (135/150) of persons with corneal ulcers. The most common cause of trauma was wooden items (46/135), followed by vegetable matter and stone injuries (23/135).

In our study, Ulcers were most commonly found at the central 55%, peripheral 42.5%, and multiple parts 2.5% of the cornea. On assessment of type of ulcers, 30% were bacterial keratitis, 27.50% were fungal keratitis, 12.5% were viral keratitis and 30% no organisms were isolated. On assessment of the isolates, 66.66% (16/24) patients had gram-positive bacteria, and 33.34% (8/24) had gram-negative bacteria. Among the gram-positive majority were Staphylococcus aureus, followed by pneumococci, streptococci, and hemolytic streptococcus. Similarly, in gram-negative bacteria, the majority were Pseudomonas aeruginosa, followed by Klebsiella pneumoniae. Study by **Al- Ghafri et al.**[4] which showed 198 (65%) microbial cultures yielded positive results. Out of these, 182 (92%) were bacterial, 13 (7%) were fungal, and 3 (1%) cases were due to a combined (bacterial and fungal) etiology. Gram-positive bacteria accounted for 102 (55.1%), of which the majority was due to Streptococcus pneumoniae. Gram-negative bacteria accounted for 77 (41.6%) cases; half were caused by Pseudomonas aeruginosa. Our study well correlated with study by **Kumari A et al.**[7] were we found out that bacterial keratitis (30%) was more common than fungal keratitis (27.5%). A Study by **Kumari A et al.** [7] documented bacterial keratitis more common than fungal keratitis, with Staphylococcus aureus was the most common bacterial pathogen.

Study by **B Rautaraya et al.**[14] of 1417 patients of corneal ulcers showed that, no organisms were found in 27.8% (394/1417) of cases, 21.4% (303/1417) were bacterial. From 303 patients, 347 bacterial isolates were cultured, 260 (74.9%) of which were gram-positive, 67 were gram-negative, and 20 were acid-fast. Streptococcus pneumoniae was the predominant isolate (86/347 [24.7%]), followed by Staphylococcus species [64/347 (18.4%)]. Pseudomonas aeruginosa (29/347 [8.3%]) was the most common gram-negative bacterial isolate. Our study also showed bacterial keratitis more than fungal keratitis.

Study by **Jose RA et al.**[9] documented that, total culture positivity was 35.56% of cases, with 18.52% of cases being bacterial and 17.04% being fungal. Gram-positive cocci were the most common (64%). The most prevalent bacterial isolate was Staphylococcus epidermidis (32%), followed by Streptococcus pneumoniae and Pseudomonas aeruginosa (16% each). In our study we found out that Staphylococcus aureus was most commonly isolated organism.

In our study, we found out that 22(27.50%) positive fungal species among the 80 patients, Aspergillus species were the most common, followed by Fusarium species and Candida species. A Study by **A. Tiwari et al.**[8] documented that the most prevalent fungal isolates were Aspergillus species. A study by **Kumari A et al.**[7] also documented aspergillus was the most common fungal pathogen.

A study by **Jose RA et al.**[9] which documented that the most prevalent fungal isolate was Fusarium species (39.13%), followed by Curvularia species and Aspergillus species (13.04%). A study by **Geethakumari PS et al.**[10] documented that Fusarium (37.05%) was the most common fungus. Our study showed that Aspergillus was the most common fungus species.

In our study, complications occurred in 19 (23.75%) patients, with adherent leucoma being the most common 5(6.25%) followed by total corneal scarring 4 (5%), descemetocele 4 (5%) followed by secondary glaucoma 3(3.75%) and perforation 3(3.75%).

At the end of treatment, 51.25% had improved vision, 38.75% had deteriorated, and 10% had maintained their vision. There was improvement in the vision at the end of treatment compared to the vision at the time of diagnosis. A study by **Lila raj puri et al.**[6] documented that, among 762 ulcers, 653 (85.7%) ulcers were healed and 68 (8.9%) were deteriorated clinically, even led to perforation of 24 eyes (35.3%). On follow-up, visual acuity improved in 495 (64.9%) eyes and deteriorated in 93 (12.2%) eyes. Compared to our study **Lila raj puri et Al** [6] showed better result as far as visual improvement concerned. They documented healing rate 85.7% and visual improvement in 64.9% patients. Our study showed fair amount of correlation with this study. We encountered only 3.75% rate of perforation in our patients and compared to **Lila raj puri et al.**[6] who documented 35.3% rate of perforation. This may be attributed to early presentations from diagnosis and intensive treatment in our patients.

5. Conclusion

Present study documents the corneal injury as one of the main risk factor associated with the infective keratitis. Males were found to be more affected than female individuals. The study documented bacterial infection most common followed by the fungal and viral infections. The commonest organism being the staphylococci aureus followed with Pseudomonas aeruginosa, aspergillus species and Fusarium species. The visual acuity improved with treating the infection.

Conflict of interest: No.

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