Original Article

Epidemiology of Microbial Keratitis in a Tertiary Care Center in Karachi

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Purpose: To measure the frequency, etiology and outcome of management of microbial keratitis in a tertiary care center in Karachi.

Material and Methods: A prospective analysis of 133 cases clinically diagnosed as microbial keratitis at Al Ibrahim Eye Hospital in Karachi over an 8 month period from 1st February to 31st September 2010, was performed. A standardised form was filled out for each patient, documenting sociodemographic features and information pertaining to ocular or systemic risk factors, management, microbiological tests and visual outcomes. Corneal scrapes were collected and subjected to microscopy / staining, culture and sensitivity. Viral ulcers, Mooren's ulcer and ulcer associated with systemic or autoimmune diseases were excluded from the study.

Results: Males (63.2%) were affected more than the females. The most common predisposing cause of ulceration was corneal trauma (48%), usually with organic agricultural materials and most frequent diagnosis was fungal keratitis (63%). Of the 68 (51.1%) patients who were followed up till the end of the treatment, visual outcome improved in 30 (44.1%), remained same in 15 (22.1%) while worsened in 23 (33.8%) patients.

Conclusion: Microbial keratitis continues to be a frequent cause for concern among ophthalmologists and health managers. This study will serve as local epidemiological database regarding microbial ulcers as well as help us in formulating guidelines for prevention of suppurative keratitis in the population at risk.

Since the discovery of antibiotics and the advancement of medical technology, the incidence of microbial keratitis has been drastically reduced especially in developed countries.[1,2] However factors like lack of medical awareness and/or inaccessibility to medical treatment, corneal ulceration continues to be an important cause of mono ocular morbidity in most Asian, African and the Middle Eastern countries.[3-6] Pakistan National survey for blindness and visual impairment also listed corneal scarring second only to cataract as the major etiology of blindness and visual disability.[7]

The knowledge regarding the predisposing risk factors to ulceration and etiological organisms within a given region is essential, firstly, to define the magnitude of the problem in terms of health care costs, human costs, and the economic burden of blindness; secondly, with regard to empirical management, as many eye clinics in the locality do not have microbiology facilities; and lastly to design an efficient and systematic public health programme for the rapid referral, diagnosis, treatment, and ultimately the prevention of this preventable but sight threatening condition in the population at risk. This approach has important public health implications for the treatment and prevention of corneal ulceration in the developing world. Unfortunately a comprehensive data as regards to the demographical and etiological factors and responsible pathogenic organisms of suppurative corneal ulcerations from Pakistan is

lacking and very few studies evaluating the etiological factors predisposing local population to corneal infection are available.[8,9] The aim of the present study was to establish the frequency, etiologies (risk factors and causative organisms) and outcomes of microbial keratitis at Ibrahim Eye Hospital. Karachi.

The aims of the management were reduction in the symptoms and signs of microbial keratitis and reduction in complications.

MATERIAL AND METHODS

It was a prospective case series. All patients above the age of 16 years, presenting in the outpatient department of Al Ibrahim eye hospital (AIEH) from February 2010 till September 2010, and clinically diagnosed as microbial keratitis were included in the study. Corneal ulcer was defined as a loss of the corneal epithelium with underlying stromal infiltration and suppuration associated with signs of inflammation with or without hypopyon. Typical or suspected viral ulcers, healing ulcers, Mooren's ulcer, neurotrophic keratitis, and any ulcer associated with systemic or autoimmune diseases were excluded from the study.

A standardised proforma was completed for each patient eligible for the study, documenting sociodemographic information as well as clinical findings including duration of symptoms, past treatment (if any), time and mode of presentation, predisposing ocular conditions and associated systemic risk factors amongst other clinical details. An informed verbal consent was taken from every patient who underwent a comprehensive ophthalmology examination, including slit lamp biomicroscopy, and clinical features of the ulcer by an ophthalmologist. The visual acuity was measured using Snellen's chart at 6 meters. The site and size of the ulcer and depth of infiltrate, as well as the severity of the ulcer, were documented. Both peripheral and central ulcers were included. In case of any history of trauma, object and place of trauma were also recorded.

Corneal scrapings were done in all the patients and were sent for direct microscopy, gram staining, culture and sensitivity. It was performed, under aseptic technique, on all patients using a sterile Bard-Parkar blade (No 15). Material obtained from scraping of the leading edge and base of each ulcer was inoculated in the media and smeared onto two separate glass slides, one stained with Gram stain and the other with 10% Potassium hydroxide (KOH) for direct microscopic evaluation.

The specimens were inoculated onto blood agar, nutrient agar, chocolate agar and McConkey agar for bacterial isolation and Sabaroud's dextrose agar for fungal culture. Bacterial cultures were considered positive only if growth of the same organism was demonstrated on both media or there was semi confluent growth at the site of inoculation on one media with identification of morphological characteristics of similar organism in Gram Stain. The specific identification of bacterial pathogens was based on microscopic morphology, staining characteristics and biochemical properties using standard laboratory criteria.

If by microscopy in KOH mount preparation, hyphae were observed in corneal smear, but failed to grow in culture, the causative organism was reported as fungal. The cultures for the patients' contact lenses and their cleaning solutions were also done when their usage was indicated. All laboratory methods followed standard protocols. Specimens for detection and isolation of Acanthamoeba were sent to Aga Khan Laboratory.

For all cases, treatment was commenced empirically with broad spectrum topical antibiotics immediately after the diagnosis was made. Subsequent treatment was tailored according to the microbiological diagnosis and sensitivity results. The final visual acuity was defined as the visual acuity on the day of discharge from the ward.

All the data was entered and analyzed using Epi info 6.0.

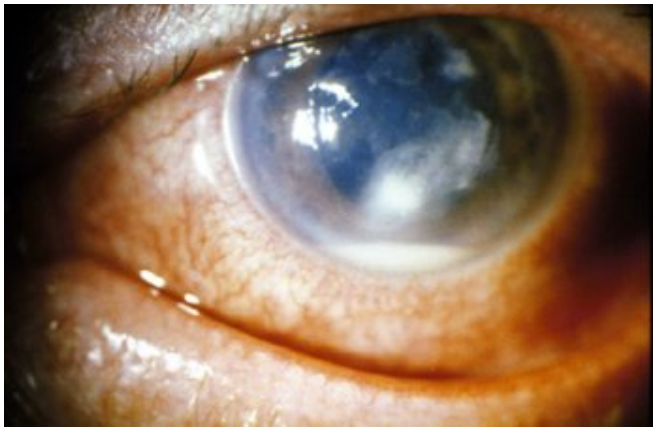


Fig. 1: Microbial Keratitis

RESULTS

From 1st February to 30th September 2010 a total of 133 patients (0.5% of 25,502 patients' OPD) with the clinical diagnosis of central corneal defect with underlying stromal infiltration with or without hypopyon were examined at the OPD of Al Ibrahim Eye Hospital. We determined the factors predisposing to bacterial, fungal, Acanthamoeba and mixed corneal infections and analyzed the treatment outcome in them. Of the total 133 patients 84 (63.2%) were males and 49 (36.8%) were females. In both groups, keratitis occurred most frequently in the middle decades of life (Table 1). The predominance of corneal ulceration in the middle years was most pronounced in females (p = < 0.001). The youngest patient was 16 years old while the oldest was of 79 years of age.

The duration of the patients' symptoms before their evaluation at Ibrahim Eye Hospital was also determined. Most of the patients were examined within 7 days after the onset of their illness. The greatest number (37 patients, 27.8%) was seen in the second week, but 19 (14.3%) patients waited for more than a month before coming to the hospital for evaluation presumably because of the distance or earlier consultation at some other place. The occupations of the patients reflected a cross section of the work force in the surrounding area (Table 2). A history of recent corneal trauma was obtained in 64 (48.1%) patients of which 31 patients presented with or gave a history of corneal foreign body. 26 (36.6% of the total trauma cases) patients had corneal injury with vegetative matter mostly tree branch or wheat stalk, followed by dust, stone etc (20; 28.9%). Other agents were wooden stick, flying insect, metal and wood pieces impacted on the cornea during welding or wood cutting, chemicals like paint and spices etc. Seven patients were soft contact lens users (Table 3).

Majority of the patients suffered corneal trauma while at work (39, 60.9%) and while traveling on road (10, 15.6%). Nine (14.1%) patients suffered corneal injury at home whereas 1 (1.6%) patient each had corneal trauma in school and playground respectively.

Ocular problems predisposing to corneal ulcer were present in 16 (22.5%) patients. Among them severe blepharitis was present in 5 patients, ectropion in 2 patients, inflamed pterygia in 2 patients, pingeculitis in 1 patient, non-leprous lagophthalmos in 2 patients, Bell's palsy with exposure keratitis in 1 patient and spheroidal degeneration in 1 patient. One patient had suture in his eye one year and another had bullous keratopathy secondary to cataract surgery. Two patients were diabetic and 1 patient had thyroid eye disease (Table 4). In contrast with the patients who had a definite history of corneal trauma, the risks for corneal ulceration associated with these conditions were presumptive.

Table 1: Frequency of microbial keratitis by age group and gender

Age Group	Male n (%)	Female n (%)	Total n (%)
16 - 20 years	11 (13)	10 (20.4)	21 (15.8)
21 - 40 years	31 (37)	10 (20.4)	41 (30.8)
41 - 60 years	32 (38)	23 (47)	55 (41.4)
60+ years	10 (12)	6 (12.2)	16 (12.0)
Total	84 (100.0)	49 (100.0)	133 (100.0)

Table 2: Frequency of microbial keratitis in patients by occupation

Occupation	No. of Patients n (%)
Student	12 (9.0)
Domestic	34 (25.6)
Tradesman / professional	38 (8.6)
Laborer	14 (10.5)
Farmer / agricultural worker	27 (20.3)
Others / Unemployed / Unknown	8 (6.0)
Total	133 (100)

Clinically 64 cases were diagnosed as bacterial while 68 were diagnosed as fungal corneal ulcers. Only one patient was suspected of having acanthamoeba infection. Cultures were positive and fulfilled the criteria established for the presence of infection in 89 (68.4%) of the 133 corneal ulcers. 55 (62% of positive cultures) patients had pure fungal growth, 25 (28% of positive cultures) had pure bacterial growth, 02 (2% of positive cultures) cases had mixed bacterial and fungal growth, and 7 (8% of positive cultures) patients were positive for Acanthamoeba. The remaining 45 (32.3%) patients

were culture negative. All except one of the 07 patients with positive Acanthamoeba cultures wore contact lenses and all except one were between 16 – 20 years of age.

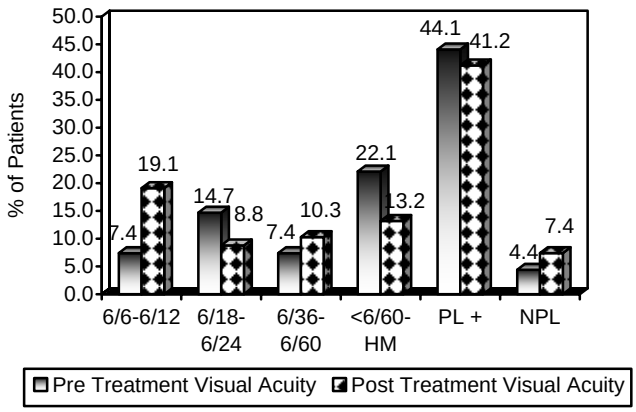
Of the total 133 patients, only 68 (51.1%) patients were followed up till the end of the treatment. Among them visual outcome improved in 30 (44.1%), remained same in 15 (22.1%) while worsened in 23 (33.8%) patients thus leaving 55 (80.9%) eyes with a visual acuity of < 6/12 (Fig. 1).

Table 3: Objects responsible for trauma in patients presenting with microbial keratitis at AIEH

Trauma Agents	No. of Patients n (%)
Metallic	3 (4.7
Non metallic †	7 (0.9
Finger nail	2 (3.1)
Animal origin / insect ±	3 (4.7)
Dirt / Sand / Mud / Stone chip	20 (31.3)
Chemical ‡	2 (3.1)
Vegetative matter*	26 (40.6)
Thermal	1 (1.6)
Total	64 (100)

Table 4: Predisposing factors for microbial keratitis at AIEH

Predisposing Factors	Particulars	No. of Patient n (%)
Ocular Factors	Corneal injury	33 (25)
	Foreign body	31 (23)
	Co existing ocular	14 (11)
	pathology	02 (1.5)
	Post operative	07 (5.3)
	Contact lens use	33 (25)
	Use of topical steroids	02 (1.5)
Systemic Disease	Diabetes mellitus	01 (0.8)
	Thyroid disease	



HM= Hand Movement, **PL** = Perception of Light
NPL = No perception of Light

Fig. 1: Pre-treatment (baseline) and post treatment visual acuity distribution among patients with microbial keratitis n = 68, P value <0.05

DISCUSSION

In our study majority of the patients with corneal ulcers, in both the genders, were in 41– 60 years of age (41.4%). This is in contrast to the study done in Oman where patients between 30 – 60 years accounted for 23% of the cases[10]. The tendency to develop corneal ulcers in the middle decades of life may be due to the fact that they are predisposed to ocular conditions like chronic dacryocystitis, dryness, cataract surgery etc. Also in our local setting people are presumably more active physically and at a higher risk for corneal injury especially men who are involved more in outdoor activities because of their responsibility as bread earners and thus at greater risk for eye injury in occupational and/or recreational settings. Also their propensity for risk taking behavior renders them less likely to wear eye protection. This is also the reason for a higher incidence of corneal ulcers in males (84%) than females, a finding similar to the study done in Malaysia,[5] Oman[10] and India.[11] Another finding stressing the need for health education addressing manual workers in general and employers in particular is that the majority of corneal ulcer patients were agricultural workers, daily wage earners or laborers (78.8%), an occupation profile similar to south India[12] and Gangetic West Bengal, Eastern India study[13] (79.3% and 70.7% respectively) and the majority of the patients suffered corneal trauma while at work (39%, 60.9%). The most common cause of corneal trauma was tree branch followed by wheat grains, leaves and thorns, soil and rocks, objects of

animal origin like cow tail and horn, metal objects, and a number of other interesting materials. Basak et al also identified corneal injury as the most common predisposing factor for microbial keratitis especially in developing countries.[13]

Of the total 89 (67%) corneal cultures that yielded pathogens, 25 (28%) were bacterial as opposed to 55 (62%) fungal cultures. These figures are in contrast to those reported by Srinivasan et al[12] where bacterial keratitis was more (47.1%) and fungal keratitis were less (46.8%) than our study. However Basak et al[13] presented results similar to our study. The possible reason for reduced bacterial corneal ulcers might be more successful treatment of bacterial corneal ulcers in the peripheral centers and/or by general practitioners. Chronic ocular surface diseases were identified as the main risk factor for fungal keratitis by Tanure et al[14] in their series but in our study only 12% patients had pre-existing ocular pathology which can predispose to development of corneal ulcers. On the other hand, dust or mud particles in the eye also resulted in development of fungal keratitis in addition to the vegetable matter thus increasing the overall number of fungal corneal ulcers in our study.

Of the 7 (8%) acanthamoeba keratitis patients, higher than that reported from Madurai (1.0%)[12] and West Bengal (0.3%)[13] six were contact lens wearers of which four were females and the remaining one patient gave a history of frequent visits to a swimming pool indicating that contact lens wear is becoming an important risk factor, mainly due to increasing urbanization as was the case in Malaysia.[5]

Only 25 (18.8%) patients presented for examination at the hospital during first three days of their illness while 14.3% took longer than 1 month to make the journey to the hospital. Though this is better than the Gangetic West Bengal study[13] where only 11% presented within first week but it still stresses strengthening of primary eye care services in Pakistan. In our study distance, prior consultation with primary eye care worker or general practitioners, inadequate or wrong treatment, self-prescription with over-the-counter available non-prescription drugs including steroids, and use of traditional eye remedy with potential fungal or bacterial contamination were responsible for late presentation at AIEH and also to their poor visual prognosis.

Interestingly, in our study, the results of microscopy were confirmed by culture findings in 90% of microbial keratitis cases suggesting the use of KOH wet mount preparation or simple microscopy alone in identifying fungal infections especially in rural based settings where microbial keratitis is a problem and scientific expertise, and/or resources is an issue. Current standard practice in managing microbial keratitis is empiric therapy with topical antibiotics followed by a modification of this therapy based on clinical response and on microbiological results of corneal scrapings.[15] Despite the severity, a majority of the eyes could be saved anatomically however a few eyes may require acute surgical intervention of some kind.

CONCLUSION

In conclusion, suppurative microbial keratitis, a sight-threatening infection and it primarily affects lower socio/economic classes. In our environment fungal infections are common. Considering the high magnitude of resulting visual loss, public education about the potential for loss of sight, need for regulating sales of drugs specially steroids, importance of use of safety measures at work and importance of timely and appropriate treatment are recommended. It is also essential to develop an efficient referral system at the community level, improve laboratory facilities and adopt effective methods of treatment and ensure follow up to decrease the burden of avoidable blindness.

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