

Microbiological study in cases of corneal ulcer and clinical outcome

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Abstract

Introduction: Cornea is anterior transparent layer of eye and important for image formation. Keratitis (corneal inflammation) and resulting corneal ulcer is important clinical challenge in ophthalmology. Prompt treatment requires identification of organism involved. Insight regarding types of organisms involved, patient demography, antibiotic sensitivity greatly helps in better patient management.

Materials and Methods: Patients with clinical diagnosis of 'Corneal ulcer', attending Department of Ophthalmology GMERS Medical College, Gandhinagar were selected for this observational study. Total 79 patients were studied. Detailed history and ocular examination were undertaken for each patient. Corneal scrapings from corneal ulcer were taken for pathological and laboratory study to identify type of organism and its antibiotic sensitivity. Data was arranged in tables for analysis. Diverse types of organisms and their frequency of occurrence was calculated. Patients were selected as per predefined criteria. Study recruitment was done after informed consent. Institutional ethics committee clearance was obtained.

Discussion: Corneal ulcer is important and serious ophthalmic problem contributing to significant portion of total blindness burden in our country. Understanding types and varieties of organisms gives insight regarding local community conditions. Antibiotic sensitivity study gives accurate guideline regarding precise use of antibiotic thereby shortening treatment period and minimizing antibiotic resistance. Comparison about various similar studies were carried out to elucidate findings.

Results: Patient demographics tables and graphs were prepared and analysis presented.

Keywords: Antibiotic, Community demography, Corneal ulcer, Organisms, Sensitivity.

Introduction

Cornea being the most anterior part of the eyeball, is exposed to atmosphere and hence prone to get infected easily. Most of the bacteria cannot easily penetrate the intact corneal epithelium. Also, other protective mechanisms, like eye lid movement and lysozymes in tear film, give additional protection. The disturbance in this system usually results in infective keratitis or commonly called 'Corneal Ulcer'. Knowing the organism pattern greatly helps in management of this important clinical condition.

Materials and Methods

Study site and study population: Patients attending Department of Ophthalmology at GMERS Medical College and Hospital Gandhinagar.

Study design - A prospective Observationnel study.

Duration of Study: 2015 TO 2016

Sample Size: 79 cases with corneal ulcer

Inclusion criteria: Only the cases showing clinical signs of Corneal ulcer and reporting first time after their present episode were recruited for study.

Exclusion criteria: Patients who will be not willing to give consent for Participation and patients who had received topical ocular therapy elsewhere.

Methods of collection of data:

A total of 79 patients presenting with a corneal Infiltrate Compatible with a diagnosis of microbial keratitis selected from the OPD of Department of Ophthalmology of GMERS Medical College and Hospital Gandhinagar. A written informed consent was taken prior to investigating procedures. For the

evaluation of the pre-disposing factor of corneal ulcer, the detailed history for demographic factors like age, sex, occupation and social status were recorded as per the predetermined proforma.

Corneal scraping was performed under aseptic conditions by an ophthalmologist using a sterile surgical blade No. 15. Scraping was performed at a slit-lamp biomicroscope after instilling topical 4% lignocaine (lidocaine) into the eye to ensure that adequate material was obtained and care taken to avoid perforation of the eye. Occasionally ulcers were very soft, sticky and had a mucoid consistency in which case they were too slippery and tenacious to be removed with a metal scraper. A disposable sterile cotton swabs was used (Jacob et al 1995). The scraping material obtained from leading edge and base of each ulcer was initially directly inoculated onto the surface of solid media such as blood agar, chocolate agar and Sabouraud dextrose agar in a row of C- shaped streaks taking care not to penetrate agar surface (Benson & Lanier 1992). The material obtained by the next scraping was spread onto labelled slides in a thin, even manner for 10 % potassium hydroxide (KOH) wet mount, Gram staining, Giemsa staining. After inoculation, the bacterial plates were incubated at 37°C for 24-48 hrs. then left for a week to detect slow growing bacteria, while the plates of Sabouraud dextrose agar were incubated at 28°C for a week to isolate fungi. Growth on the C-streaks is significant, while growth outside the C-streaks is likely to because of contamination. Gram staining is done to identify whether the organism grown is gram positive or gram negative. The organisms are further identified to genus and species

level depending on motility and biochemical reaction. Antibiotic susceptibility testing was done. Identification of the micro-organisms was done using various biochemical reaction as well as routine tests. Biochemical tests were included to identify Gram positive (catalase, coagulase, etc.) and gram-negative bacteria (catalase, oxidase, indole, MR-VP, urease, citrate, TSI, O/F etc.). Data was arranged in tabulated form and percentages were calculated. Average and standard deviation were calculated forage.

Institute ethics committee clearance:

Institute Ethics Committee Clearance was obtained before the start of the study.

Table 1: Age wise distribution of cases in study group

Age (Years)	No. of cases	Percentage
<20	9	11.4
20-40	25	31.6
40-60	35	44.3
>60	10	12.7
Total	79	100

Fig. 1: Bar diagram of occupation wise distribution of cases in Study group

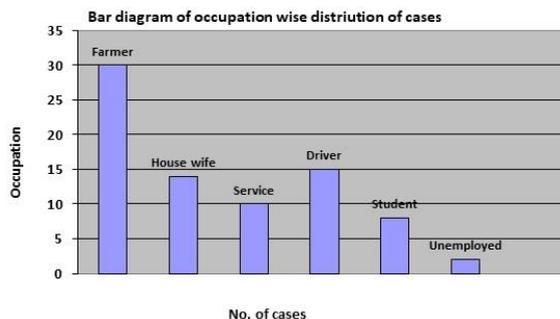


Table 2: Predisposing factors wise distribution of cases in study group

Predisposing Factor	Particular	No.	%
Ocular Trauma	Vegitative Injury	15	19
	Injury by wooden object	8	10.1
	Injury by unknown foriegn body	5	6.3
	Stone Injury	3	3.8
	Thorn Injury	2	2.5
	Injury by animal tail	1	1.3
	Chemical Injury	1	1.3
	Total Ocular Trauma	35	44.3
	Conjunctivitis	13	16.5
Pre existing Trauma diseases	Blepharitis	4	5.1
	Dacryocystitis	2	2.5
Contact lens wearing diseases	Total	19	24.1
	--	5	6.3
Corticosteroid therapy	--	2	2.5
	--	3	3.8
Post-operative	--	3	3.8
Viral Infection	--	5	6.3
Not defined	--	7	8.9
Total	--	79	100

Table 3: Microorganism isolated wise distribution of cases in study group

Microorganism isolated	No. of cases	Percentage
Aspergillus	14	17.7
Staphylococcus	16	20.3
Fusarium	5	6.3
Streptococcus pneumoniae	8	10.1
Candida albicans	4	5.1
Pseudomonas	5	6.3
Corynaebacterium	2	2.5
Fonsecaea Pedrosoi	1	1.3
No growth	24	30.4
Total	79	100

Table 4: Sensitivity pattern of bacteriological isolates

Antibiotics	Organism			
	Staphylococcus aureus (n=16)	Streptococcus pneumoniae (n=8)	Pseudomonas (n=5)	Corynaebacter (n=2)
Erythromycin	12	4	5	2
Gentamycin	10	6	5	0
Ciprofloxacin	16	5	5	2
Cotrimazole	8	3	5	0
Cefuroxime	16	4	0	2
Oxacillin	10	3	0	0

Discussion

In our study among the 79 corneal ulcer patients studied the commonest age group affected was between 40-60 yrs., followed by 20-40, >60 and <20 (Table 1). In a study conducted by Nath et al in 2011 the commonest age group was between 41-50 years which agreed with the present study. 69 In accordance with our results, Srinivasan et al. (1997) found that the most susceptible persons to keratitis were adults of 31-60 years (59% of 434 cases studied). Garg et al. (2000) found that the average age in keratitis was 46.5 years.

Our study was predominant by male patients (62%) as compared to female patients (38%) (Table 2). Similar male preponderance was found in other studies. Because of their work profile male are more exposed to outdoor activities which increases their vulnerability to the disease. Srinivasan et al. in 1997 studied 434 patients where males were affected more than females in the ratio of 2:1. Garg et al. in 2000 found male to female ratio of 4:1. A study conducted in 2005 by Butler et al. examined 190 patients of keratitis, out of which 54% were males and 46% were females. Males were more commonly affected than females in a study conducted by Bandyopadhyay et al.

Most patients with keratitis (out of 79 cases studied) were farmers (38%) followed by followed by Driver (19%), Housewife (17.7), service holder (12.7%), student (10.1%) and Unemployed (2.5) (Table 3). It is obvious that in the cases of males, occupational risk plays a key role in contracting the disease. The same result was seen in a study in India where the majority of 434 keratitis cases were farmers (56.4%) followed by housewives (12% of total cases) (Srinivasan et al. 1997). Similar findings were also reported in Egypt (Al ghalibi 2000) and China (Xie et al. 2001).

Trauma to the eye was the most significant risk factor of keratitis where 44.3% of the 79 cases were due to trauma followed by due to predisposing factor - 24.1 and due to others 24.1 (Table 4). Srinivasan et al. (1997) found also that the most predisposing factor for keratitis was corneal trauma in 284 (65.4%) out of 434 cases. Keay et al. (2006) also reported trauma as the most common risk factor in 106 (36.4 %) out of 291 keratitis cases studied. Trauma was the commonest risk factor in a study conducted by Bandyopadhyay et al. in west Bengal. Risk factors other than trauma showed lower

percentages (Table 4). Similar findings were reported by Panda et al. 1997, Wong et al. 1997, Yee et al. 1997, Al ghalibi 2000, Xie et al. 2001, and Keay et al. 2006.

Of the 79 cases of keratitis studied, 39.2% were due to bacterial infection, 30.4% were due to fungal infection while other 30.4% were negative for bacteria and fungi. This finding correlate with a study conducted by Basak et al. which showed 62.7% patients had fungal infection, 22.7% had bacterial infection while 14.1% had mixed infection. Srinivasan et al. in 1997 found 47.1% bacterial infection, 46.8% fungal infection and in 5.1% mixed infection. A study conducted by Leck et al. found that fungal isolates were 44% in southern India and 37.6% in Ghana as compared to 29.3% and 13.8% bacterial isolates from south India and Ghana respectively. Gopinathan et al. 2002 and Bharathi et al. 2003 found comparable results.

In our study among most common isolate was *Staphylococcus aureus* 16(20.3%) followed by *Aspergillus* 14(17.7%), *Fusarium* 5(6.3%), *Streptococcus pneumoniae* 8(10.1%), *Candida albicans* 4(5.1%), *Pseudomonas* 5(6.3%), *Corynaebacterium* 2(2.5%) and no growth were 24(30.4%). *Staphylococcus aureus* was most common which is like the earlier study by Basak et al. However, The most common infecting bacteria was *Streptococcus pneumoniae* in Nepal and south India,^(1,2,4) and *Pseudomonas* spp in Ghana and Bangladesh.^(3,5) In our study, *Staphylococcus aureus* was 100% sensitive to ciprofloxacin and cefuroxime. *Streptococcus pneumoniae* was 50% sensitive to ciprofloxacin. *Pseudomonas* and *Corynaebacterium* were 100% sensitive to erythromycin and ciprofloxacin (Table 4). According to this study both second and fourth generation fluoroquinolones are equally effective against commonly found organisms in corneal ulcer. Ganopadhyay et al found no significant treatment difference between fluoroquinolone and fortified therapy in terms of final visual outcome, but concluded that fluoroquinolones have the advantage of decreased toxicity and duration of treatment.⁽⁷⁾

In our study among fungal isolates, *Aspergillus* was the predominant isolate in West Bengal in a study conducted by Basak et al in 2005, 59.8 %. A study conducted by Despande & Koppikar, 1999 in Mumbai and parts of South India by Venugopal et al, 1989 showed comparable results. Comparable results were

reported in Nepal and Bangladesh by Upadhyay et al, 1991 and Williams et al, 1987 respectively. But, *Fusarium* spp was found to be more common in other studies in South India {Bharathi et al, 2003 (42.82 %); Leck et al, 2002 (39.9 %); Srinivasan et al, 1997(47.1%)}. The *Fusarium* species preponderance was also found in Paraguay, Florida, Hong Kong and Singapore (Mino de Kasper et al, 1991; Liesegang & Forstor, 1980; Houang et al, 2001; Wong et al, 1997). These differences in predominance of fungal isolates could be attributed to different climatic conditions.

Results

During study period, a total of 79 patients were diagnosed with corneal ulcer and following parameters were studied such as age, sex, occupation of patients and predisposing factors for

corneal ulcer, identifying the causative bacteria and studying the antibiotic sensitivity of these bacteria to commonly used antibiotics.

1. In our study among the 79 corneal ulcer patients studied the commonest age group affected was between 40-60 yrs., followed by 20-40, >60 and <20 (Table 1).
2. Our study was predominant by male patients (62%) as compared to female patients (38%) (Table 1).
3. Most patients with keratitis (out of 79 cases studied) were farmers (38%) followed by Driver (19%), Housewife (17.7), service holder (12.7%), student (10.1%) and Unemployed (2.5) (Fig. 1).
4. Trauma to the eye was the most significant risk factor of keratitis where 44.3% of the 79 cases were due to trauma followed by due to predisposing factor - 24.1 and due to others 24.1 (Table 2).
5. Of the 79 cases of keratitis studied, 39.2% were due to bacterial infection, 30.4% were due to fungal infection while other 30.4% were negative for bacteria and fungi (Table 3).
6. In our study among most common isolate was *Staphylococcus aureus* 16(20.3%) followed by *Aspergillus* 14(17.7%), *Fusarium* 5(6.3%), *Streptococcus pneumoniae* 8(10.1%), *Candida albicans* 4(5.1%), *Pseudomonas* 5(6.3%), *Corynaebacterium* 2(2.5%) and no growth were 24(30.4%) (Table 3).
7. In our study, *Staphylococcus aureus* was 100% sensitive to ciprofloxacin and cefuroxime. *Streptococcus pneumoniae* was 50% sensitive to ciprofloxacin. *Pseudomonas* and *Corynaebacterium* were 100% sensitive to erythromycin and ciprofloxacin (Table 4).

Conclusion

The epidemiological patterns vary from one country to the other and in different geographical areas in the same country. Males are more prone to corneal ulcers than females as they are more involved in outdoor activities. Trauma is the leading cause for the corneal

ulcers and most of the fungal ulcers are because of trauma due to vegetative matter. The incidence of the bacterial & fungal keratitis is almost the same in this set up. The higher incidence of fungal ulcers may be related to the agricultural activities and the environmental conditions. Microscopic evaluation of corneal smear and culture remains the gold standard for the identification of pathogens causing microbial keratitis. [6,7] Culturing, however, allows sensitivity testing so that treatment modifications can be made in an informed manner if the clinical response to the initial treatment is inadequate. Currently most commonly isolated organisms are sensitive to second generation and fourth generation fluoroquinolones currently being used. It is therefore still justifiable that these can be used for treatment of suspected bacterial keratitis as first line empirical therapy. Persistent efforts should be put for continuous surveillance and epidemiological characterization which are imperative to treat and prevent morbidity and blindness of population at risk in India.

Conflict of interest: None

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