Int.J.Curr.Microbiol.App.Sci (2017) *6*(9): 2410-2416

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 9 (2017) pp. 2410-2416**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.609.296

Clinico-Epidemological Profile of Corneal Ulcer Cases from Rural Hospital of Haryana, India

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Keywords

Corneal ulceration, Keratitis, Morbidity.

Article Info

Accepted:
23 August 2017
Available Online:
10 September 2017

A B S T R A C T

Corneal ulceration is a leading cause of ocular morbidity and blindness worldwide. India being an agricultural land, corneal trauma leading to rapidly progressing corneal ulceration is very common. Many studies have been published on corneal ulcers all over the country but no study has been published from rural part of Haryana. Therefore this study was undertaken to find the rate of bacterial and fungal isolates in corneal ulcers and to assess their clinical epidemiology. The present study was carried in the Department of Microbiology, MMIMSR, Haryana on 200 clinically suggested cases of corneal ulcers. Corneal scrapings were subjected to microscopy and culture. Of 200 suspected cases, 43.5% were culture positive. *Staphylococcus aureus* and *Pseudomonas aeruginosa* were the predominant gram positive and negative bacterial isolates. *Aspergillus* species was the most prevalent fungal isolate. Ocular trauma and tropical steroids was the commonest predisposing factor. Sugarcane leaf trauma was the commonest vegetative origin trauma. Redness, blurred/diminished vision was most commonly seen in fungal keratitis while pain, redness was most commonly seen in bacterial keratitis. The clinical presentations of bacterial and fungal corneal ulcers are often overlapping and confirmation by microbiological testing is essential for better treatment.

Introduction

Corneal ulcer is a key cause of blindness throughout the world. India being an agricultural land, superficial corneal trauma in farming frequently leads to rapidly progressing corneal ulceration and visual loss (Srinivasan *et al.,* 1997). Suppurative keratitis is an important cause of monocular vision loss worldwide but unfortunately the clinical features do not always correlate to the classical textbook description. Thus the consequences mislead the diagnosis, further leading to improper treatment and complications. In view of that quick and accurate identification of microorganisms entails for proper management. Many studies have been published on corneal ulcers from various parts of India (Geethakumari *et al.,* 2011; Tewari *et al.,* 2012 and Balagurunathan *et al.,* 2012) but from Haryana inspire of being the agricultural hub of the country, no study has been published from the rural part of the state.

Materials and Methods

The study was carried out on 200 clinically suggested patients of corneal ulceration attending Ophthalmology OPD and IPD of Maharishi Markandeshwar Institute of Medical Sciences and Research (Mullana, Haryana) for a period of 2 years i.e., Oct 2012-2014.

Sample collection

After a detailed clinical history, the findings of corneal ulcer were noted after a thorough slit lamp examination. The effected eye was locally anesthetized after washing with normal saline to remove all necrotic material. Scrapings from base and edges of the corneal ulcer were collected using a sterile Bard Parker blade no.15 or Kimura's Spatula and send to the Microbiology laboratory.

Sample processing

The scrapings were inoculated on Blood agar and Sabourand's dextrose agar and processed further as per the standard laboratory procedures for bacterial and fungal identification (Wilson, 1998).

Results and Discussion

Out of 200 suspected cases of bacterial and fungal keratitis, 87(43.5%) showed growth. Of these fungal isolates were 53(60.91%), bacterial isolates were 27(31.03%) while 7(8.04%) showed mixed growth.

Among the bacterial isolates, gram positive cocci accounted 16(59.25%) and gram negative bacilli 11(40.74%). *Staphylococcus aureus* 11(68.75%) constituted majority of the gram positive isolates followed by *Staphylococcus epidermidis* 5(31.25%). *Pseudomonas aeruginosa* constituted 6(54.54%) of the gram negative isolates followed by *Escherichia coli* 3(27.27%) and *Klebsiella pneumoniae* 2(18.18%). Among the fungal isolates, *Aspergillus* species was the most prevalent (43.39%) followed by *Fusarium solani*, *Curvularia geniculata* and *Candida albicans* with 11.32% (Table 1).

In patients of corneal ulcer, ocular trauma was the most common predisposing factor followed by topical steroids and diabetes mellitus. Among the positive cases, ocular trauma contributes 57.4%, tropical steroids 80.5% and diabetes mellitus 72.7% (Fig. 1).

There is a close association of predisposing factors with etiological agents. Ocular trauma which was the most common predisposing factor showed profound association with fungal etiology (81.48%) as compared to it acute conjunctivitis and contact lens wearers showed association with bacterial etiology (100%). Diabetes mellitus and topical steroids had equal association with both bacterial and fungal etiology (Table 2).

The frequency of positivity in ocular trauma cases was more due to vegetative origin (74.07%) as compared to foreign body (25.92%). Sugarcane leaf trauma (52.5%) was the commonest amongst vegetative origin trauma. The commonest majority of the isolates from the vegetative origin were fungal in etiology (91.6%).

In contrast, in trauma due to foreign body, occurrence of bacterial and fungal etiological agents was equal (Table 3).

Studying the demographic profile in the present study, of the 200 cases of bacterial and fungal keratitis, 56.5% were male and 43.5% were female. Maximum (51.5%) patients were in age group 20-40 yrs and minimum (3.5%) in age group < 20 yrs of age. Rural and urban population accounted for 58.5% and 41.5% of the cases respectively.

Farming (40%) was the predominant occupation followed by housewives (23%). Maximum number of cases were seen in the months July-Sep (38.5%) followed by Oct-Dec (31%) (Table 4).

The common sign and symptoms in fungal keratitis were redness (81.25%), blurred/diminished vision (81.25%), pain (68.7%) and irregular feathery margins (75%) while in bacterial keratitis, pain (75%), redness (87.5%), lacrimation (62.5%) and hypopyon (37.5%) were noted (Table 5).

Scarring of the cornea developing as a result of suppurative corneal ulcer is the second noteworthy reason of preventable blindness after un-operated cataract among people in Asia, Africa and Middle East. The rate of culture positivity in the present study was 43.3% while findings of researchers from different parts of the India showed variation (Basak *et al.,* 2005; Bharathi *et al.,* 2002 and Assudani *et al.,* 2013). It may be due to diversity in environmental conditions, occupation and socioeconomic factors which varies from region to region.

Monomicrobial infection was seen in majority (91.04%) of the cases the most common being fungal (60.91%). In mark contrast high prevalence of bacterial isolates was reported by Upadhyay *et al.,* (1991) and Gopinathan *et al.,* (2009). Higher incidence of fungal corneal ulcer in the present study may be due to hot and humid climate of this region.

Table.1 Species wise distribution of fungal isolates

Fungal Species	No. of isolates	Percentage %
Aspergillus flavus	15	28.30
Aspergillus fumigates	5	9.44
Aspergillus niger	3	5.66
Fusarium solani	6	11.32
Candida albicans	6	11.32
Curvularia geniculata	6	11.32
Helminthosporidium	3	5.66
Mucor species	3	5.66
Pseudallescheria boydii	3	5.66
Drechslera species	3	5.66
Total	53	100

Table.2 Frequency of infectious agents with predisposing factors

	Total	Fungal (%)	Bacterial (%)	Mixed (%)
Ocular trauma	54	44(81.48%)	7(12.9%)	3(5.55%)
Diabetes Mellitus	8	4(50%)	4(50%)	0
Acute and Chronic Conjuctivitis	3	0	3(100%)	0
Contact Lens Wear	6	0	6(100%)	0
Topical Steroids	16	7(43.7%)	7(43.7%)	2(12.5%)
Total	87	55(63.21%)	27(31.03%)	5(5.74%)

Table.3 Association among basis of trauma, cause of trauma and infectious agents

Basis of trauma	Cause of trauma	No of cases	Bacterial cases	Fungal cases	Mixed infection cases
Vegetative origin	Sugarcane leaf	21(52.5%)	-	5(23.8%)	3(14.28%)
	Paddy leaf	12(30%)	-	12(100%)	-
	Grass stick	3(7.5%)	-	3(100%)	-
	Thorn prick	4(10%)	-	4(100%)	-
Total		**40(74.07%)**		**37(91.6%)**	**3(14.28%)**
Foreign body	Wood chip	7(50%)	5(71.4%)	2(28.5%)	-
	Iron piece	2(25%)	2(100%)	-	-
	Stone	5(25%)	-	5(100%)	-
Total		**14(25.92%)**	**7(50%)**	**7(50%)**	
Grand Total		**54**	**7**	**44**	**3**

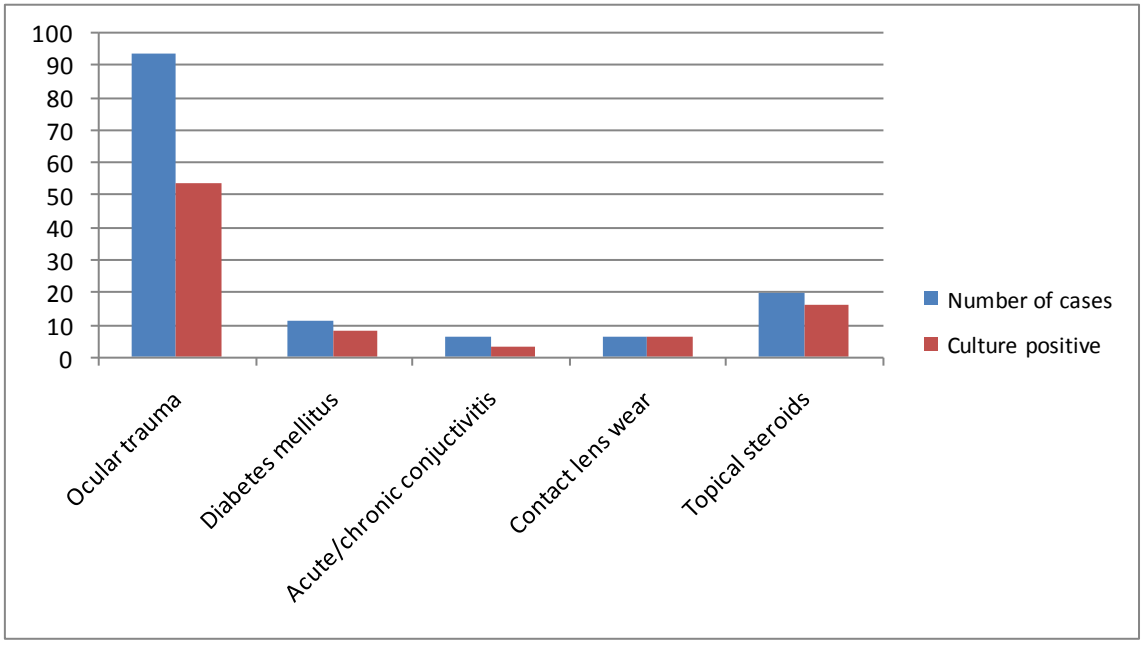
Table.4 Demographic profile of patients

Demographics	Particulars	Number of positive patients (%)
Gender	Male	113(56.5%)
	Female	87(43.5%)
Age in yrs	<20	07(3.5%)
	20-40	103(51.5%)
	40-60	63(31.5%)
	>60	27(13.5%)
Residential Status	Rural	117(58.5%)
	Urban	83(41.5%)
Occupation	Farmer	80(40%)
	Carpenter	20(10%)
	Gardner	17(8.5%)
	Labourer	27(13.5%)
	Student	10(5%)
	Housewife	46(23%)
Seasonal variation	Jan- March	14(7%)
	April- June	47(23.5%)
	July- Sep	77(38.5%)
	Oct- Dec	62(31%)

Table.5 Clinical features in corneal ulcer (N=No of culture positive cases)

Clinical Features	Fungal keratitis N=53	Bacterial keratitis N=27
SYMPTOMS		
Redness	43/53(81.13%)	7/27(87.5%)
Pain	36/53(67.9%)	6/27(75%)
Lacrimation	09/53(56.3%)	5/27(62.5%)
Photophobia	07/53(43.7%)	3/27(37.5%)
Blurred/Diminished vision	43/53(81.13%)	6/27(75%)
SIGNS		
Lid oedema	05/53 (31.2%)	5/27(62.5%)
Hypopyon	03/53(18.7%)	3/27(37.5%)
Conjunctival congestion	05/53(31.2%)	3/2737.5%)
Irregular feathery margins	12/53(75%)	4/27(50%)

Fig.1 Correlation of predisposing factors with culture positivity



Staphylococcus aureus (68.75%) was the predominant isolate among the Gram positive bacterial. This observation is comparable to studies by Kaliamurthy *et al.,* (2013) (64.5%) and Tiwari *et al.,* (2012) (60%). *Staphylococcus aureus* and *S. epidermidis* form the commensal of extraocular surfaces & invade corneal tissues when compromised by antimicrobial and/or corticosteroid therapy or trauma.

The present study revealed *Pseudomonas aeruginosa* (54.54%) as the most isolated organism among the Gram negative bacterial causes which is in accordance with that reported by Sirikul *et al.,* (2008) and Keshav *et al.,* (2008).

Aspergillus species (43.39%) was the most prevalent pathogen in the present study as the cause of fungal keratitis. This was comparable to Chander J *et al.,* (1993) and Kaur P *et al.,* (2011) which showed *Aspergillus* spp. as the most common isolate with 41.8% and 50% respectively. Predominance of *Aspergillus* species may be explained by differences in climate and the natural environment. Moulds with enteroblastic conidia adhering in dry chains as in *Aspergillus* spp. were more frequently isolated from patients in the north of the country where the environment usually drier and dustier, than in more humid south. Also the spores of *Aspergillus* spp. can tolerate hot, dry weather conditions.

Haryana being an agriculture land, farming induced trauma is very common. Corneal trauma was the most frequent predisposing factor of suppurative corneal ulcer in the present study (52.5%) unlike results of Western countries where contact lens wear was the chief predisposing factor as seen by Frederic *et al.,* (2001) and Sirikul *et al.,* (2008). Low occurrence of Contact lens-induced corneal ulcers in this study may be due to the fact that the majority of the patients were from rural background where use of contact lens is rare. The fungal etiology (81.48%) was most commonly associated with ocular trauma in the present study. The reason behind it may be, as fungi are soil saprophytes and plant pathogens as a result

linked to agricultural workers. Furthermore Indian climate favors the growth of these fungi.

Frequency of ocular trauma due to vegetative origin was predominant (74.07%) than foreign body. Fungal keratitis was mainly caused by trauma due to vegetable origin (91.06%) and sugarcane leaf accounted for 23.8% of the cases. This is in accordance with Chander *et al.,* (1993) and Sanjeev H *et al.,* (2012). Injury with sugarcane leaf predominates as it is the principal agricultural product in this region and the height of sugarcane plant reaches the average level of the human eye.

Studying the demographic profile, corneal ulceration was higher in males and in age group 20-40 years as observed by Hagan *et al.,* (1995) and Bashir *et al.,* (2005). Male predominance may be because they are physically more active and mostly involved in outdoor activities therefore much more vulnerable to trauma. The seasonal variation showed a rise in number of cases in hot, humid season of July-Sep (38.33%). A large number of cases of keratitis in the months of Oct-Dec (31%) were also seen which the harvesting season of sugarcane is.

In bacterial corneal ulcers, toxins produced by the bacteria diffuse through the cornea into the anterior chamber exerting an irritative effect. Pain occurs due to the exposure of the terminal fibres of the ophthalmic division of the trigeminal nerve. In the present study, pain (87.5%), redness (87.5%), lacrimation (62.5%), hypopyon (37.5%) was the main clinical feature noted in bacterial keratitis. Fungal ulcers are characterized by a relatively indolent course. Symptoms are much milder than the signs. The hypopyon is thick and immobile, and it is due to invasion into the anterior chamber of fungal hyphae enmeshed in thick exudates. In the present study, the prime clinical features observed in fungal keratitis were redness (81.25%), blurred/diminished vision (81.25%), pain (68.7%) and irregular feathery margins (75%). It clearly shows that the clinical features do not always correlate with the textbook description. Certain clinical characteristics of corneal ulcers may suggest a specific pathogen, but a reliable diagnosis cannot be made by clinical appearance alone.

To conclude, corneal ulcer is an avoidable vision-threatening disease that still represents a considerable proportion of the daily new cases that creates a huge burden on the resources of health services. The clinical presentations of bacterial and fungal corneal ulcers are often overlapping. The definitive diagnosis of ulcers caused by multiple organisms can only be arrived at by microbiological evaluation. Accurate diagnostic tests not only play a key role in patient management but also reduce the risk of the patient developing long-term complications.

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How to cite this article:

Kanishtha Sharma, Dipender Kaur Najotra and Varsha A. Singh. 2017. Clinico-Epidemological Profile of Corneal Ulcer Cases from Rural Hospital of Haryana, India. *Int.J.Curr.Microbiol.App.Sci.* 6(9): 2410-2416. doi: https://doi.org/10.20546/ijcmas.2017.609.296