International Journal of Sciences & Applied Research

www.ijsar.in

A clinico-microbiological study of Suppurative Keratitis – one year experience in a tertiary care hospital of South India

Kothapalli Sreelakshmi[1], Kandati Jithendra[2]*, Sarvepalli Skanda Harshita[1], Gujjula Chandra Sekhar[1] , Buchineni Madhavulu[3], Pathapati Rama Mohan[3]

[1]Department of Ophthalmology, Narayana Medical College, Nellore -524 003, Andhra Pradesh, India.
[2]Department of Microbiology, Narayana Medical College, Nellore -524 003, Andhra Pradesh, India.
[3]Department of Pharmacology, Narayana Medical College, Nellore -524 003, Andhra Pradesh, India.
Correspondence Address: *Dr. Kandati Jithendra, Department of Microbiology, Narayana Medical College, Nellore -524 003, Andhra Pradesh, India.

Abstract

Aim: To determine the epidemiological pattern, risk factors and etiological agents of suppurative keratitis attending a tertiary care hospital.

Methods: All suspected cases of suppurative keratitis attending the ophthalmology department were clinically examined and confirmed cases were included in the study period of one year from June 2014 to May 2015.All the socio economic demographic data pertaining to the case which include the duration of illness, history of injury, previous medication were noted for analysis. After obtaining the data corneal scrapings were collected and microscopy by gram stain, KOH mount and inoculated on BA, CA, MA and SDA.

Results: A total of 802 cases were evaluated in the study. Males were more common; Ocular trauma was the common risk factor (70.3%) followed by associated ocular diseases (19.7%). Paddy husk was the most common causative agent of ocular trauma (49.65%).More number of cases (47.1%) were reported between Oct to Dec. 614 (76.5%) case were culture positive,of which 47.1 % are pure fungal,15.7% were pure bacterial and13.7% shows mixed bacterial and fungal growth. Pseudomonas aeruginosa (32.6%) was the most common bacterial pathogen and Fusarium and Aspergillus flavus were the most common fungal pathogens.

Conclusion: To summarize Suppurative keratitis is a serious concern among the entire ophthalmologists. Prompt preventive measures to avoid corneal injury and appropriate timely intervention reduce the chances of loss of vision. Regional information about the probable etiological agents helps to formulate empirical treatment guidelines for suppurative keratitis and helps to formulate guidelines for the people at risk of developing keratitis.

Keywords: Suppurative Keratitis, Ocular trauma, Fusarium, Aspergillus sp

Introduction

Suppurative keratitis leading to scarring of cornea is one of the major causes of monocular blindness after unoperated cataract cases. [1] The etiological agents of suppurative keratitis include a variety of Bacteria, Fungi, and Protozoa. Untreated the condition may lead to opacification of cornea and ultimately perforation leading to blindness. Lack of diagnostic facilities and

prompt treatment directly affects the patient management leading to severe morbidity. In the tropics, paucity of laboratory facilities makes diagnosis based on clinical characteristics. Hence the treatment is often empirical. The etiology of suppurative keratitis is variable from continent to continent, and even from country to country and with in the country also. With in the tropics two thirds of cases are caused by filamentous fungi and the predisposing factor being ocular trauma. [2, 3] The epidemiological pattern of corneal ulceration varies significantly depending upon the patient population, climate, geographical region and health of cornea. [4] Hence planning a corneal ulcer management depends upon the local etiology. Many studies have investigated the epidemiology, causative agents, predisposing factors and treatment plans in India and abroad. [5, 6, 7] The present study was done to evaluate the various causes, predisposing factors and etiological agents of cases of suppurative keratitis attending the tertiary care hospital. This would help to formulate empirical treatment guidelines in the management of suppurative keratitis.

Materials and Methods

The present was study was done at Central Clinical Microbiology Laboratory of Narayana Medical College and Hospital in association with Department of Ophthalmology for a period of One year from June 2014 to May 2015. The study was approved by the institutional ethical committee.

Inclusion criteria: All the patients attending the OPD of Ophthalmology department who were diagnosed and confirmed as suppurative 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. [8] Patients consent was mandatory to include in the study. The total socio demographic data of the included patient including duration of symptoms, history of any injury, clinical risk factors, past treatment, predisposing ocular conditions was noted for analysis.

Exclusion criteria: All the patients clinically examined and confirmed as viral ulcers, Healing ulcers, interstitial keratitis, Marginal keratitis, Neurotrophic keratitis, atheromatous ulcer and ulcer associated with systemic and auto immune diseases were not included in the study.

Clinical Examination: All the patients were examined by slit-lamp biomicroscope. The visual acuity was measured by standard protocol. By using variable slit on the slit lamp and using wet sterile flourescein paper strip the size of the ulcer was measured and noted in millimeters along with size of stromal infiltrate and depth of the ulcer. Other important features noted were pigmentation of ulcer, ulcer margin, floor, impacted foreign body. Height of the hypopyon if present was noted. Any other associated conditions like Bells palsy, Contact lens, corneal degeneration, lagopthalmos, trichiasis, Dacarocystitis, surgery on the cornea was noted.

Collection of Corneal scrapings: An ophthalmologist collected the scrapings from the base and active margins of the ulcer under strict aseptic conditions by using sterile Bird-Parker blade No 15 under magnification of slit lamp after installation of 2% lignocaine. In Patients on topical treatment collection was done after 24 hours after stopping the therapy.

Processing of Specimens: The corneal scrapings obtained were inoculated onto culture media and further smeared on clean glass slides. One of the smears was performed grams stain and the other examined under 10% KOH wet mount direct microscopic examination. For bacterial and fungal isolation the material was inoculated on to 5% sheep blood agar, Chocolate agar, MacConkey agar and Sabourad's Dextrose agar. The plates for bacterial isolation was

incubated at 37^0c and examined for 24 -48 hrs and discarded after no growth. The SDA for fungal isolation was incubated in BOD at 28^0c and examined for one week and discarded after no growth.

The bacterial pathogens were identified by gram stain and standard biochemical tests. Fungal growth on SDA was identified by colony characteristics, Morphology on Lactophenol cotton blue mount, Slide culture technique as per standard guidelines.

Results

In the present study a total of 802 confirmed cases of suppurative keratitis with or without hypopyon were included. 548/802(68.33%) of them were males and 254/802(31.67%) were females. The most common age group in both sexes was 31- 40 years (233; 29.1%) followed by 41-50 years (193; 24.1%). Urban cases were less common (154; 19.2%) than rural (648; 80.8%). Most of the cases were agricultural workers (423; 52.7%) working in fields and students formed the least (31; 3.9%) among all the groups. Majority of the cases were reported between the months of Oct to Dec (378: 47.1%) indicating the working season in the fields and minimal cases during Jan to Mar (96; 12%). 410 (51.12%) of cases reported between 2^{nd} to 3^{rd} week of illness and 121(15.09%) reported after 4^{th} week of illness. 688 (85.79%) of cases were on some form of primary medication before visiting the hospital. Of 688 cases 512(74.41%) were on topical antibacterial drops, 90(13.8%) on anti fungal drops, 44(6.4%) on anti viral and 42(6.10%) on corticosteroid drops. [TABLE-1].

TABLE-2 clearly represents the data of variety of predisposing factors in cases of suppurative keratitis which were divided in to traumatic and ocular causes.564(70.3%) of cases had a history of corneal injury, majority by paddy husk 49.65% , followed by jute plant 23.94% and other causes include insects, finger nails, chemicals, sand or dirt and pencil or pen injury. Among the other ocular causes which accounted for 158(19.7%) cases 8% had dacrocystitis, 6% with corticosteroid overuse and others conditions include contact lens, trichiasis, lagopthalmos, dry eye and post operative cases. However all these predisposing factors for suppurative keratitis were presumptive [8].

TABLE-3 represents the etiology of cases of suppurative keratitis. A total 614(76.5%) cases were culture positive. 126(15.7%) were pure bacterial, 378(47.1%) were pure fungal and 110(13.7%) were both bacterial and fungal .188(23.5%) were culture negative. 124(15.5%) cases were both microscopy and culture negative and 64(8%) were microscopy positive and culture negative. 236 bacterial pathogens were isolated from 126 cases. Of the 236 bacterial pathogens 119 were gram positive and 117 were gram negative. Pseudomonas aeruginosa (32.6%) was the most commonly isolated bacterial pathogen followed by Staphylococcus aureus (25.8%) and Staphylococcus epidermidis (13.1%). Other pathogens include Pneumococci(4.7%), Micrococcus sp(3.8%), Bacillus sp(3%), Escherichia coli(5.1%), Moraxella sp(4.7%) ,H.influenzae (4.2%), Acinetobacter Sp(0.8%) and Klebsiella pneumoniae (2.1%).

Table 1: Demographic data of cases of corneal ulcers in the study.			
Sr. no.	Demographics	Particulars	N(%)
1	Sex	Male	548(68.33)
		Female	254(31.67)
2	Age of the cases	<11 years	15(1.9)
		11-20 years	69(8.6)
		21-30years	174(21.7)
		31-40 years	233(29.1)
		41-50 years	193(24.1)
		51-60 years	67(8.4)
		>60 years	51(6.4)
3	Resident status	Rural	648(80.8)
		Urban	154(19.2)
4	Occupation	Agricultural workers	423(52.7)
		Laborers industrial	178(22.2)
		Students	31(3.9)
		House hold	45(5.6)
		Business/professionals	60(7.5)
		Others	65(8.1)
5	Seasonal variation	Jan-mar	96(12.0)
		Apr-jun	126(15.7)
		July-sep	202(25.2)
		Oct-dec	378(47.1)
6	Presentation to hospital	Before 1st week	98(12.22)
		1st to 2nd week	81(10.10)
		2nd to 3rd week	410(51.12)
		3rd to 4th week	92(11.47)
		After 4th week	121(15.09)
7	H\o of medication	Anti bacterial	512(74.41)
		Anti fungal	90(13.08)
		Anti viral	44(6.4)
		Corticosteroid	42(6.10)

Table 2: Predisposing factors data in cases of corneal ulcers.		
Predisposing factors	Particulars	N (%)
Occular causes	Corneal injury	564(70.3)
	Impacted foreign body	97(12.1)
	Occular diseases	158(19.7)
	Dacrocystitis	64(8.0)
	Trichiasis	14(1.7)
	Lagopthalmos	8(1.0)
	Keratopathy	16(2.0)
	Dry eye	24(3.0)
	Post operative	12(1.5%)
	Topical steroid overuse	48(6.0)
	Contact lens	14(1.8)
Traumatic causes	Finger nail	16(2.84)
	Paddy husk	280(49.65)
	Jute plant	135(23.94)
	Vegetative matter	49(8.69)
	Insects	38(6.74)
	Chemicals	16(2.84)
	Sand/stone/dirt	22(3.9)
	Pencil/pen injury	8(1,42)

Table 3: Aetiology of corneal ulcers.		
Type of micro-organism	NO OF CASES	PERCENTAGE
Pure bacterial growth	126	15.7
Pure fungal growth	378	47.1
Mixed microbial growth (bacterial and fungal)	110	13.7
Culture positive cases	614	76.5
Culture negative cases	188	23.5
Bacterial negative	68	8.5
Fungal negative	120	15
Microscopy negative culture negative	124	15.5
Microscopy positive culture negative	64	8

Out of 378 fungal culture positive cases 418 isolates were grown. Fusarium and Aspergillus flavus (84;20.1%) were predominant pathogens followed in order by Aspergillus fumigatus (67;16%), Aspergillus niger (54;12.9%), Pencillium sp (41;9.8%), Curvalaria sp(34;8.1%), Dematacious fungi(16;3.8%) and Candida albicans (4;1%). 34(8.1%) of the fungi grown were unidentified [TABLE-4].

Table 4: FUNGAL PATHOGENS ISOLATED FROM CORNEAL ULCERS.		
FUNGI	NUMBER	PERCENTAGE
Fusarium Sp	84	20.1
Aspergillus niger	54	12.9
Aspergillus flavus	84	20.1
Aspergillus fumigatus	67	16.0
Cuvularia sp	34	8.1
Pencillium Sp	41	9.8
Candida albicans	4	1.0
Dematacious fungi	16	3.8
Unidentified	34	8.1
Total fungal culture positive cases[pure &mixed] =418		

Discussion

In our present study majority of the suppurative keratitis cases were agricultural labourers indicating their occupation profile and most of the cases (47.1%) were seen during peak season of Oct to Dec which is the agricultural and harvesting period in South India. These findings were in concordance with the studies of Srinivasan et al, Bharathi MJ et al [8, 9] but in contrast to study of Hagan M et al [10] where the incidence is around only 16.1%. Injury by paddy husk was the most common predisposing factor of corneal injury as mentioned in many other studies of South India. The reason is paddy being the main crop grown in south India, any preventive programme addressing the injury could lessen the incidence of suppurative keratitis by injury.

Majority of the patients in the study (51.12%) presented during the 2^{nd} – 3^{rd} week of illness and 15.09% after 4^{th} week of illness. The most important observation was 6.1% of patients were on corticosteroid topical application indicating unnecessary on table prescription of drug without diagnosis .However explaining the seasonal trend in cases of suppurative keartatis, October to December was commonly observed in our study which is the harvesting season,but studies by Leck AK et al,[11]Williams AG et al,[12]Chander J et al [13]state that incidence of suppurative keratitis is more common during dry, windy season. Whereas studies by Kotigadde S et al,[14]Hagan M et al [10]and Jeng BH et al[15] state that incidence is more common during hot and humid seasons.

Out of total 802 cases, 614 (76.5%) were culture positive which is in concordance with the studies of Srinivasan M et al[8] 60.8% and Bharathi et al[9] 70.6% . Fungi were identified as the principal etiological agents in the study 47.1% when compared to bacterial pathogens 15.7% and mixed growth was observed in 13.7%.The findings in our study is in accordance with the studies of Jagadish chander et al[16], Jayahar Bharathi M et al[9] in India and Thomas PA[17] ,Tahereh Shokohi et al[18] abroad. In the present study 126(15.7%) were culture positive for bacterial pathogens which is in concordance with the findings of Dunlop AA et al. [2]

The predominant fungal pathogens in the study were Fusarium and Aspergillus flavus (20.1%). These findings coincide with the findings of Leck AK et al [11], Dunlop AA et al [2] and Sharma S et al.[20].Few studies

in India by Upadhayay M et al[1], Deshpande et al[21], Garg P et al[22] and abroad by Williams G et al [23]report Aspergillus as the predominat fungal pathogen in cases of suppurative keratitis. A review of the literature shows that there are distinct patterns of geographical variation in the etiology of suppurative keratitis and considerable variation in the proportion due to fungi has been documented. The proportion of corneal ulcers caused by filamentous fungi increases towards tropical latitudes. In more temperate climates, fungal ulcers are uncommon and are more frequently associated with Candida species than filamentous fungi. [24][25] Fusarium has also been observed as one of the important pathogen in Florida, Paraguay, Nigeria, Tanzania, and Singapore. [26] [27] [28][29]

In our present study Pseudomonas aeruginosa was the predominant bacterial pathogen (32.6%) which is in accordance with the findings of Dunlop et al [2] and also by Williams et al,[12] who found that 40% of bacterial isolates were Pseudomonas spp. A predominance of Pseudomonas species has been reported in Hong Kong, Florida, and Paraguay. [25][28] [29]. Staphylococcus aureus was the next common pathogen (25.8%) followed by Staphylococcus epidermidis (13.1%). However studies from Nepal and south India, reported Gram positive cocci as the primary cause of bacterial keratitis. [1][8] This difference can be explained by the changes in the climates and natural environment.

Conclusion

Suppurative keratitis is a serious concern among the entire ophthalmologists. Prompt preventive measures to avoid corneal injury and appropriate timely intervention reduce the chances of loss of vision. Regional information about the probable etiological agents helps to formulate empirical treatment guidelines for suppurative keratitis and helps to formulate guidelines for the people at risk of developing keratitis.

References

1. Upadhyay MP, Karmacharya PC, Koirala S,et al.Epidemiologic characteristics, predisposing factors, and etiologic diagnosis of corneal ulceration in Nepal. Am J Ophthalmol 1991;111:92–9.
2. Dunlop AAS, Wright ED, Howlader SA,et al. Suppurative corneal ulceration in Bangladesh. Aus NZ J Ophthalmol 1994;22:105–10
3. Panda A, Sharma N, Das G,et al.Mycotic keratitis in children: epidemiologic and microbiologic evaluation. Cornea 1997;16:295-9
4. Ansons AM. Corneal ulceration caused by penicillin resistant Neisseria gonorrhoeae. Arch Ophthalmol 1987;105:1325
5. Gonzales CA, Srinivasan M, Whitcher jP, Smolin G. Incidence of corneal ulceration in Madurai District, south India. Ophthalmic Epidemiol 1996;3:159-66
6. Erie JC, Nevitt MP, Hodge DO, Ballard DJ. Incidence of ulcerative keratitis in a defined population from 1950 through 1988. Arch Ophthalmol 1993;111:1665-71.
7. Despande SD, Koppikar GV. A study of mycotic keratitis in Mumbai. Indian J Pathol Microbiol 1999;42:81-87
8. Srinivasan M, Gonzales CA, George C, Cevallos V, Mascarenhas JM, Asokan B, et al. Epidemiology and aetiological diagnosis of corneal ulceration in Madurai, south India. Br J Ophthalmol 1997;8:965-71.
9. Bharathi MJ, Ramakrishnan R, Vasu S, Meenakshi R, Palaniappan R. Epidemiological Characteristics and laboratory diagnosis of fungal keratitis: a three-year study. Indian J Ophthalmol 2003;51:315-21.
10. Hagan M, Wright E, Newman M, Dolin P, Johnson G. Causes of suppurative

keratitis in Ghana. Br J Ophthalmol 1995;79:1024-28.
11. Leck AK, Thomas PA, Hagan M, Kaliamurthy J, Ackuaku E, John M, et al. Aetiology of suppurative corneal ulcers in Ghana and south India, and epidemiology of fungal keratitis. Br J Ophthalmol 2002;86:1211-15.22
12. Williams G, Billson F, Husain R, Howlader SA, Islam N, McCellan K. Microbiological diagnosis of suppurative keratitis in Bangladesh. Br J Ophthalmol 1987;71:315-21.
13. Chander J, Sharma A. Prevalence of fungal corneal ulcers in northern India. Infection 1994;22:207-09.
14. Kotigadde S, Ballal M, Jyothirlatha, Kumar A, Srinivas R, Shivananda PG. Mycotic keratitis: a study in coastal Karnataka. Indian J Ophthalmol 1992;40:31-33.]
15. Jeng BH, McLeod SD. Microbial keratitis (Editorial). Br J Ophthalmol 2003;87:805-06.
16. Jagdish Chander, NidhiSingla, NaliniAgnihotri, Sudesh Kumar Arya,Antariksh Deep - Keratomycosis in and around Chandigarh ; A five year study from a north Indian tertiary care hospital. Indian J Patho-Microbiol 2008: 51: 2: 304–306.
17. Thomas PA –Fungal infections of the cornea. Eye 2003; 17: 852-62.
18. Tahereh Shokohi, Kiumars Nowroozpoor, Dailami – Fungal Keratitis in patients with corneal ulcer in San, Northern Iran. Archives of Iranian Medicine 2006; 9: 222 – 227.
19. Sharma S, Athmanathan T. Diagnostic procedures in infectious keratitis. In: Nema HV, Nema N, editors, Diagnostic procedures in Ophthalmology. Jaypee Brothers Medical Publishers, New Delhi; 2002. pp 232-53.
20. Despande SD, Koppikar GV. A study of mycotic keratitis in Mumbai. Indian J Pathol Microbiol 1999;42:81-87.
21. Garg P, Gopinathan U, Choudhary K, Rao GN. Keratomycosis: clinical and microbiological experience with dematiaceous fungus. Ophthalmology 2000;107:574-80
22. Williams G, Billson F, Husain R, Howlader SA, Islam N, McCellan K. Microbiological diagnosis of suppurative keratitis in Bangladesh. Br J Ophthalmol 1987;71:315-21.
23. Tanure MA, Cohen EJ, Sudesh S,et al.Spectrum of fungal keratitis at Wills Eye Hospital Philadelphia, Pennsylvania. Cornea 2000;19:307–12.
24. Ormerod LD, Hertzmark E, Gomez DS,et al . Epidemiology of microbial keratitis in southern California. A multivariate analysis. Ophthalmology 1987;94:1322–33.
25. Mino de Kasper H, Zoulek G, Paredes ME, Alborno R, Medina D, Centurian de Morinigo M, et al. Mycotic keratitis in Paraguay. Mycoses 1991;34:251-54.
26. Gugnani HC, Talwar RS, Njoku-Obi AN, Kodilinye HC. Mycotic keratitis in Nigeria. A study of 21 cases. Br J Ophthalmol 1976;60:607-13
27. Mselle J. Fungal keratitis as an indicator of HIV infection in Africa. Trop Doct 1999;29:133-35.
28. Houang E, Lam D, Fan D, Seal D. Microbial keratitis in Hong Kong: relationship with climate, environment, and contact lens-disinfection. Trans R Soc Trop Med Hyg 2001;95:361-67
29. Khanal B, Kaini KR, Deb M et al. Microbial keratitis in eastern Nepal. Tropical Doctor2001;31: 168–9.
30. Liesegang TJ, Forster RK. Spectrum of microbial keratitis in south Florida. Am J Ophthalmol 1980;90:38–47].