Journal of Surgical Radiology
https://journalsurgrad.com/
ISSN Print 2156-213X| ISSN Online: 2156-4566 Volume: 01 Issue: 01 Open Access

Research Article

Drug Utilization pattern of bacterial corneal ulcer at Tertiary Care Teaching Hospital

Dr. Khamer Jahan[1] and Dr Divya Jain[2]
[1,2]Associate Professor, Department of Ophthalmology, Ayaan Institute of Medical Sciences Teaching Hospital & Research Centre, India

*Corresponding Author
Dr Divya Jain

Article History
Received: 05.01.2022
Revised: 15.01.2022
Accepted: 25.02.2022
Published: 26.03.2022

Citations:
Khamer Jahan and Divya Jain. Drug Utilization pattern of bacterial corneal ulcer at Tertiary Care Teaching Hospital. *J Surg Radiol, 01*(01) 2022; 16-20.

Abstract: *Background*: Corneal ulcer is a potentially sight threatening ocular condition and the leading cause of monocular blindness in developing countries. Infectious keratitis can be caused by various pathogens i.e, bacteria, fungi, virus and parasites. Ocular trauma is a far more common predisposing factor of infectious keratitis in developing countries, whereas pre-existing ocular disease and contact lens are common risk factors in developed countries. Hence, an understanding of the aetiologic agents, epidemiologic features and risk factors that occur in specific region are important in rapid recognition, timely institution of therapy, optimal management and prevention of disease entity. Materials and methods: All patients with suspected infectious central corneal ulceration presenting to the ocular microbiology and cornea service. Sociodemographic data and information pertaining to risk factors were recorded, all patients were examined, and corneal cultures and scrapings were performed. Result: A total of 78 patients identified with bacterial corneal ulcer of which 58.97% were males, 37.17% were farmers. Trauma was seen as major predisposing factor in 75.64% cases. The major etiological agent was found in our study was Staphylococcus aureus (60.25%) followed by Pseudomonas in 16.66% and mixed infection in 7.69%. Conclusion: Bacteria are the most common cause of infectious keratitis in this patient population, with coagulase-negative Staphylococcus and Pseudomonas as the most common isolates. The prevalence of culture-positive fungal keratitis is significantly lower than that of bacterial keratitis. Contact lens wear is the most common risk factor associated with infectious keratitis.

Keywords: Acanthamoeba; Bacteria; CornealUlcer; Fungus; Kera.

INTRODUCTION

Corneal ulcer is a potentially sight threatening ocular condition and the leading cause of monocular blindness in developing countries. [1] Infectious keratitis can be caused by various pathogens i.e, bacteria, fungi, virus and parasites. In a study conducted in Chittagong, Bangladesh, 53.5% bacteria and 39.9% fungi were found as microbial aetiology of corneal ulcer. [2] The incidence of fungal keratitis (42.86%) was higher than bacterial keratitis (25%) in Rajshahi, northern part of Bangladesh. [3] Aetiologic and epidemiologic pattern of corneal ulceration varies with the patient population, geographic location and climate and it tends to vary somewhat over time. [4] Infectious corneal ulcer is associated with some predisposing factors. Ocular trauma is a far more common predisposing factor of infectious keratitis in developing countries, whereas pre-existing ocular disease and contact lens are common risk factors in developed countries. [5] Hence, an understanding of the aetiologic agents, epidemiologic features and risk factors that occur in specific region are important in rapid recognition, timely institution of therapy, optimal management and prevention of disease entity.

The purpose of the study was to identify causative pathogens and to determine the predisposing factors of corneal ulcer of patients attending tertiary care hospitals.

MATERIALS AND METHODS

PATIENTS

All patients with infectious central corneal ulcers presenting to the ocular microbiology and cornea service were included in the study. In the Hospital is a large referral centre and Undergraduate training institute that provides eye care for patients from all over south India. Patients were seen consecutively after the initial clinical diagnosis of corneal ulceration was made. Ulceration 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 viral ulcers and healing ulcers were excluded as were Mooren's ulcers, marginal ulcers, interstitial keratitis, sterile neurotrophic ulcers, and any ulcers associated with autoimmune conditions. A standardised form was filled out on each patient documenting sociodemographic information as well as clinical information including duration of symptoms, previous treatment, predisposing ocular conditions, and associated risk factors.

CLINICAL PROCEDURES

Every patient was examined at the biomicroscope by an ophthalmologist. The size of the epithelial defect after staining with fluorescein was measured with the variable slit on the biomicroscope and recorded in millimetres on a standardised form. In similar fashion the size and depth of the stromal infiltrate was recorded. A sketch of each

ulcer was also drawn on the form using standardised frontal and cross-sectional diagrams, and the presence or absence of a hypopyon was recorded and the height measured in millimetres. Associated ocular conditions such as blepharitis, dacryocystitis, dry eyes, corneal anaesthesia, or ocular leprosy were noted.

After detailed ocular examination corneal scrapings were performed under aseptic conditions on each ulcer by an ophthalmologist using a flame sterilised Kimura spatula. Scrapings were performed at an operating microscope after instillation of 4% lignocaine (lidocaine) without preservatives. Material obtained from scraping the leading edge and the base of each ulcer was inoculated directly onto sheep's blood agar, chocolate agar, and potato dextrose agar (PDA), and into brain heart infusion broth (BHI) without gentamicin sulphate. Material from the corneal scraping was also smeared on three separate glass slides: one for Gram stain, one for Giemsa stain, and the third for microscopic examination in the clinic as a KOH wet mount. All KOH smears were then sent to the laboratory for confirmation. When KOH smears were positive for amoebic cysts a further corneal scraping was performed and the material was inoculated onto non-nutrient agar overlaid with Escherichia coli in an attempt to isolate Acanthamoeba spp.

LABORATORY PROCEDURES

All bacterial cultures were incubated aerobically at 37ºC. Cultures on blood agar and chocolate agar were evaluated at 24 hours and at 48 hours and then discarded if there was no growth. Cultures inoculated in BHI were examined in similar fashion. Fungal cultures inoculated onto PDA were incubated at 27ºC, examined daily, and discarded at 1 week if no growth was present. Cultures on non-nutrient agar overlaid with E coli were examined daily for the presence of Acanthamoeba spp and likewise discarded at 1 week if there were no signs of growth. All laboratory methods followed standard protocols which have been discussed in detail in a previous report.8

Microbial cultures were considered positive only if growth of the same organism was demonstrated on two or more solid media; or there was semiconfluent growth at the site of inoculation on one solid medium associated with the identification of the organism of appropriate morphology and staining characteristics on Gram or Giemsa-stained corneal smears. Cultures for Staphylococcus epidermidis and diphtheroids were considered positive only if there was moderate growth on at least two solid media. Liquid media were found to be so easily contaminated that they could not be relied upon for accurately identifying organisms. The specific identification of bacterial pathogens was based on microscopic morphology, staining characteristics, and biochemical properties using standard laboratory criteria. Fungi were identified by their colony characteristics on PDA and by their microscopic appearance in lactophenol cotton blue.

RESULTS

A total 90 cases included for study after meeting the inclusion criteria. In this study corneal ulcer was more common in males (58.97%) [Figure 1]. Farm workers were most commonly affected occupation group (35.6%) followed by laborers [Table 1]. 24.4% children were affected. Lower middle class and poor accounted for almost two third cases of corneal ulcer [Table 2]. Total of 13 (14.4%) patients had associated eyelid and adnexal problems.

In this study, central corneal ulcer (in central 5mm diameter) was noted in (12.2%) cases and peripheral corneal ulcer (within 3mm from limbus) was seen in (88.46%) cases. Hypopyon seen in 23.07% of cases of corneal ulcer. On bacteriological examination, it was found that in 70% cases, causative organism were gram positive cocci, followed by gram negative bacilli (16%). Staph aureus was seen in 60.25% of isolates, Pseudomonas aeruginosa in 16.66%, mixed infection in 7.69% [Figure2]. Definite history of trauma was noted in 75.64%, in which vegetative matter such as paddy husk, plant leaf etc constituted around 65.38%, flying insect 11.53%, brick/iron chip 7.69% [Figure 3]. Overall presenting visual acuity in affected eye fulfilled the WHO criteria for in severe vision impairment in 61.1% [detailed in Table3].

Table 1: incidence of corneal ulcer in different occupation

Type of occupation	No of cases	percentage
Farm workers	32	35.6
Labourers	11	12.2
Milkmen	1	1.1
Florist	6	6.7
Businessmen	3	3.3
student	9	10
housewife	6	6.7
Children	22	24.4

Table 2: Corneal ulcer in different socioeconomic strata

Socio economic status	No of cases	Percentage

Higher	8	8.9
middle	22	24.4
Lower middle	35	38.9
Poor	25	27.8

Table 3: Visual outcomes in patients of corneal ulcer

Visual Acuity at presentation	Number	Percentage
Normal (<6/9)	4	4.4
Mild (6/9 to 6/18)	5	5.6
Moderate (6/18 to 6/60)	16	17.8
Severe (6/60 to 3/60)	55	61.1
Blind (>3/60)	10	11.1
Visual Acuity at final visit		
Normal (<6/9)	00	00
Mild (6/9 to 6/18)	15	16.7
Moderate (6/18 to 6/60)	13	14.4
Severe (6/60 to 3/60)	33	36.7
Blind (>3/60)	28	31.1

DISCUSSION

In our study, of the 621 patients with a clinical diagnosis of keratitis, 181 patients had cultureproven keratitis, which was 53.6% of those for which cultures were obtained. The proportion of positive cultures acquired in this study was comparable with the reported ranges from studies in Los Angeles (California), Dallas (North Texas), Miami (Florida), Mexico, Bangladesh, and South India [Table 5]. [6] The sex distribution was virtually equal between females and males in our study, and the mean age of this patient population was similar to those reported in several other studies. [7]

In our study, bacterial keratitis was the most common type of infectious keratitis, followed by fungal and Acanthamoeba keratitis. This is consistent with several other studies conducted in Los Angeles, Dallas, Florida, and Mexico City, which have climate conditions comparable to South Texas [Table 5]. [8] However, we found fewer cases of fungal keratitis compared with these studies. To identify the causative organisms, we only used cultures because smears typically cannot be used to diagnose the type of organism, especially in bacterial and fungal infections. This might have contributed to fewer observed cases of fungal keratitis in our study, since cultures for the diagnosis of fungal keratitis are not as sensitive as other forms of diagnostic techniques. In addition, although certain specialized stains, such as acridine orange, calcofluor white, and lactophenol-cotton blue, can be used to detect Acanthamoeba in smears, such stains were not used in our study, and Acanthamoeba keratitis was diagnosed only based on positive cultures. Furthermore, although in vivo confocal microscopy can be used to detect Acanthamoeba and fungi in the cornea, we did not use this method as it is not available in many facilities.

Florida has a notably higher rate of fungal keratitis (20.8%) than South Texas and several other locations in North America with similar latitudes [Table 5]. This higher rate is likely due to the tropical climate in Florida; this finding is further supported by the results of other studies that reported a high rate of fungal keratitis in tropical climate regions, such as Bangladesh and South India. In developing countries, however, this may be confounded by the large percentage of patients with fungal keratitis related to agricultural work. [9]

The predominant bacterial isolate was CoNS, which is consistent with the findings from Dallas, Los Angeles, Mexico City, and Bangladesh [Table 6]. CoNS has consistently been shown to be a common cause of

bacterial keratitis as it inhabits the skin and can invade a compromised cornea. Our study further supports this concept, as CoNS was the most common bacterial organism isolated in cases associated with underlying corneal and ocular surface diseases. Interestingly, the proportion of Pseudomonas keratitis, which was the second most common bacterial isolate, was higher in South Texas and Miami than the reported range of 7.6–20% found in other cities in the United States, Bangladesh, and South India [Table 6]. The prevalence of Moraxella in South Texas (7.8%) and Dallas located in North Texas (4.2%) was higher than most other locations across the world. Moraxella is known to commonly affect immunocompromised patients, which is consistent with our cohort as some of our Moraxella-positive cases were immune compromised individuals. [10]

Fusarium, a filamentous fungus, was found to be the predominant fungal isolate in our study, as well as in Dallas, Miami, Mexico City, and South India [Table7]. Interestingly, Aspergillus, which is typically associated with corneal trauma and tropical climates, was not

isolated in South Texas; however, it has been isolated in several other studies with similar patient characteristics and climates. Filamentous fungi have been found to be more common than yeast fungi in areas with warmer climates, such as Texas, Florida, California, and Mexico. Our findings are consistent with this finding as only a single yeast fungus, Candida, was isolated in our study.

Several reports have found a positive association between filamentous fungal keratitis and contact lens use and ocular trauma, which may account for the more substantial proportion of filamentous fungal keratitis observed in our study as contact lens wear was the leading predisposing risk factor for infectious keratitis.

Contact lens wear was the most frequent risk factor associated with infectious keratitis in our study, followed by underlying corneal diseases, preceding ocular trauma, and ocular surface diseases. It is well established that the majority of cases with infectious keratitis in developed countries are related to contact lens use, while most cases in developing countries are caused by ocular trauma. In our study, contact lens associated corneal ulcers were most prevalent in patients ≤ 40 years, whereas corneal ulcers associated with underlying corneal and ocular surface diseases were more frequently encountered in patients > 40 years old, which is similar to the results of previous studies. [11] Furthermore, the occurrence of bacterial keratitis associated with contact lens use in our study is consistent with the range iterated by other studies

in developed countries (31–53%). Pseudomonas has been reported as the most common bacterial species associated with contact lens wear in South Texas, Dallas, and Florida. [12]

In our study, approximately one-third of cases with fungal keratitis occurred in those with underlying corneal and ocular surface diseases. Fungal keratitis has often been attributed to trauma and contact lens wear. In a large multicenter study in the United States, 37% of fungal keratitis cases were associated with contact lens use, followed by ocular surface disease (29%) and ocular trauma (25%). However, this rate varies in different locations; for example, contact lens use was found to be the most common risk factor associated with fungal keratitis (41%) in Boston, but trauma was the most common risk for this type of infectious keratitis in Florida (44%). [13]

Despite many studies have reported an increase in infectious keratitis during the warmer months, the majority of our cases presented during the months with lower temperatures, showing a peak in March and November–December. [14] CoNS and Moraxella were the only bacterial isolates to have a significant seasonal distribution, with the majority of cases occurring during the cooler months. Just over half of the CoNS cases associated with ocular surface disease were observed in the winter (53.8%). Ocular surface disease exacerbated by low temperatures may have put these patients at an increased risk of keratitis. [15] As anticipated, the majority of cases with fungal keratitis occurred during the warmer months, which is consistent with the results of previous studies conducted in both developed and developing countries. [16]

CONCLUSION

In conclusion, bacteria were the most prevalent etiology of infectious corneal ulcers in South Texas. Coagulase-negative Staphylococcus and Pseudomonas were the most common bacterial isolates; this result is consistent with the results of other studies reporting the etiologies of bacterial keratitis in populations across the United States andtheworld. Fusarium, afilamentousfungus, was the most frequent fungal isolate, but the overall prevalence of fungal keratitis was lower in South Texas than in other cities of developed countries.

Ascontactlensuseisthemostcommonriskfactor associated with infectious keratitis in South Texas and many other populations, contact lens wearers should always be reminded of this potential sightthreateningcomplication.

REFERENCES

1. Farjo A, McDermott M, Soong HK. Corneal anatomy, physiology, and wound healing. in: M. Yanoff, J.S. Duker (Eds.) Ophthalmology. 3rd ed. Mosby, St. Louis, MO, 2008, 203-208.
2. Gupta N, Tandon R, Gupta SK, Sreenivas V, Vashist P. Burden of Corneal Blindness in India. Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive and Social Medicine. 2013; 38:198-206.
3. Al-Mujaini A, Al-Kharusi N, Thakral A, Wali UK. Bacterial Keratitis: Perspective on Epidemiology, Clinico-Pathogenesis, Diagnosis and Treatment. Sultan Qaboos University Medical Journal. 2009; 9:184-195.
4. Srinivasan M, Gonzales CA, George C. Epidemiology and etiological diagnosis of corneal ulceration in Madurai, south India. Br J Ophthalmol 1997; 81:96571.
5. Asbell P, Stenson S. Ulcerative keratitis. Survey of 30 years laboratory experience. Archives Ophthalmology. 1982; 100:77-80.
6. Mahajan VM. Acute bacterial infections of the eye: their aetiology and treatment. The British Journal of Ophthalmology. 1983; 67:191-194.
7. Garg P, Rao GN. Corneal Ulcer: Diagnosis and Management. Community Eye Health. 1999; 12:21-23.
8. 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, 232-53
9. Rohatgi JN. Bacteriology of corneal ulcer with special reference to hypopyon corneal ulcer. Indian J Ophthalmol. 1967; 15:54-7
10. Chirambo MC, Tielsch JM, West KP, Katz J. Blindness and visual impairment in southern Malawi. Bull WHO 1986; 64:567–72.
11. Chirambo MC. Causes of blindness among students in blind school institutions in a developing country. Br J Ophthalmol 1976; 60:665–8.
12. Rapoza PA, West SK, Katala SJ, Taylor HR. Prevalence and causes of vision loss in central Tanzania. Int Ophthalmol 1991; 15:123–9.
13. Brilliant LB, Pokhrel RP, Grasset NC, Lepkowski JM, Kolstad A, Hawks W, et al. Epidemiology of blindness in Nepal. Bull WHO 1985; 63:375–86.
14. Khan MU, Hague MR, Khan MR. Prevalence and causes of blindness in rural Bangladesh. Ind J Med Res 1985; 82:257– 62.
15. Gilbert CE, Wood M, Waddel K, Foster A. Causes of childhood blindness in East Africa: results in 491 pupils attending 17 schools for the blind in Malawi, Kenya and Uganda. Ophthalmic Epidemiol 1995; 2:77–84.
16. Thylefors B, Negrel AD, Pararaja Segaram R, Dadzie KY. Available data on blindness (update 1994). Ophthalmic Epidemiol 1995; 2:5–39.