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Original Research Article

A Clinical and Microbiological Study of Bacterial Corneal Ulcer at NMCH Patna

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Abstract:

Background and Objectives: Corneal ulcer is a potentially sight threatening ocular condition and the leading cause of monocular blindness. It can be caused by various pathogens. Bacteria are the most common infective organisms responsible for significant vision loss and ophthalmic morbidity. The severity of corneal infection depends on the underlying condition of the cornea and Pathogenicity of the infecting bacteria. It is rare in the absence of predisposing factors and hence most commonly associated with ocular trauma, so timely intervention is needed at the earliest possible period to prevent the sight threatening complications.

Methods: A prospective clinical study is conducted on patients who attended, ophthalmology OPD, NMCH Patna, with definite signs and symptoms of corneal ulcers, Bacterial corneal ulcers are specifically studied in detail after microbiological evaluation.

Conclusion: To conclude bacteria are the most common infective organisms responsible for significant vision loss and ophthalmic morbidity. Confirmation by microbiological diagnosis is very essential in order to limit the ocular morbidity and prevent complications, timely intervention, regular follow up and patient's compliance can reduce the visual morbidity and complications.

Keywords: Bacterial corneal ulcer, Prevalence, Microbiological identification, Antibiotics.

Introduction

The eyes are the "windows to the soul" is an expression that is often used to describe the deep connection one feels when looking into another's eyes. However like windows, the eyes work both ways. They are not only important in seeing into another person's soul, but they are also vital in how we view the world around us. Sight and vision are important because they allow us to connect with our surroundings, keep us safe and help to maintain the sharpness of our minds. Diseases affecting the cornea are major causes of blindness worldwide, second only to cataract in overall importance. The epidemiology of corneal blindness is complicated and encompasses a wide variety of infectious and inflammatory eye diseases that cause corneal scarring which ultimately leads to functional blindness. In addition, the prevalence of corneal disease varies from country to country and even from one population to another. Ocular trauma and corneal ulceration are significant causes of corneal blindness that are often underreported, but may be responsible for 1.5-2.0 million new cases of monocular blindness every year in the developing world. [1] Surveys in Africa and Asia have confirmed the causes of blindness worldwide consistently lists, corneal scarring second only to cataract as the major aetiology of blindness and visual disability in many of the developing nations in Asia, Africa and the Middle east. [2] Blindness continues to be one of the major public health problems in developing countries. Cataract and corneal diseases are major causes of blindness in countries with less-developed economies. According to the world health organization,corneal diseases are among the major causes of vision loss and blindness in the world today after cataract and glaucoma. In India, it is estimated that there areapproximately 6.8 million people who have vision less than 6/60 in at least one eye due to corneal diseases. Of these, about a million have bilateral involvement. [3]

It is expected that the number of individuals with unilateral corneal blindness in India will increase to 10.6 million by 2020. According to the national programme for control of blindness (NPCB) estimates, there are currently 120,000 corneal blind persons in the country. According to this estimate there is addition of 25,000-30,000 corneal blindness cases every year in the country. [3] The burden of corneal disease in our country is reflected by the fact that 90% of the global cases of ocular trauma and corneal

ulceration, leading to corneal blindness, occur in developing countries. [4] Etiological and epidemiological pattern of corneal ulceration varies with the patient population, geographic location and climate. [5] A comparison of population based studies in the USA and India indicates that there is at least a tenfold higher incidence of corneal ulceration in India [6] In the United States, the main risk is felt to be contact lens (CL) wear. [7] Corneal ulcers may be infective or non- infective. Bacteria, fungi, viruses and protozoa are the commonest causes of infectious corneal ulcers. Though, bacteria causing corneal ulcers have gradually decreased over years following the advent of antibiotics, they are still responsible for majority of infective ulcers occurring in our country. The epidemiological pattern of corneal ulcers due to bacteria varies fromregion to region significantly and the understanding of epidemiologic pattern in different areas is essential for the development of a proper strategy for prevention of blindness caused by bacterial corneal ulcers. The proper understanding of changing pattern of bacteria affecting cornea, the changed antibiotic sensitivity pattern and the altered clinical presentation with indiscriminate use of antibiotics, are important in the management of bacterial corneal ulcer. And also emerging antibiotic resistance has posed a difficult task in the management of bacterial corneal ulcers. Skilful usage of antibiotics, adequate supportive therapy and management of co-existing morbidities are the challenges today in order to prevent or reduce corneal blindness due to bacterial corneal ulcers.

Objectives

- To compare the clinical course of Gram positive and Gram-negative bacteria.
- Microbiological identification of types of bacteria
- To study the response of bacterial corneal ulcer with different antibiotics.

Material and Methods

A prospective clinical study was conducted, the materials for the study were drawn from, corneal ulcer patients, who attended Ophthalmology OPD, Nalanda Medical College and Hospital Patna, Bihar. Study duration of one year.

Patients were selected randomly from those attending ophthalmology department at NMCH Patna, with a definite signs and symptoms of corneal ulcers. Patients were subjected to microbiological evaluation for both bacteria and fungi. Those patients with gram staining and culture positive for bacteria were taken for detailed study. Out of total 70 corneal ulcer Patients, 35 were of bacterial aetiology, 30 were fungal, 2 were with mixed infections with both bacteria and fungi and 3 were sterile.

Inclusion Criteria

- Ram positive bacteria.
- Gram negative, culture positive results.
- Diabetes mellitus, HIV infection.
- Bilateral corneal ulcer.

Exclusive Criteria

- Patient with fungal corneal ulcer.
- Viral keratitis.
- Protozoan and Acanthamoeba keratitis.
- Ulcerations secondary to vernal or atopic conjunctivitis.

A standard clinical proforma was filled in all cases, which included history taking, visual acuity using snellen's visual acuity chart, clinical examination, ocular examination under slit lamp biomicroscopy, laboratory investigations, microbiological evaluations and treatment. All patients were examined in details for disease severity, chronicity, ocular signs and associated systemic conditions. Particular attention was paid to the history of ocular trauma, its nature and severity, associated foreign body in to the eye, history of Diabetes mellitus, usage of systemic steroids and traditional eye medicines.

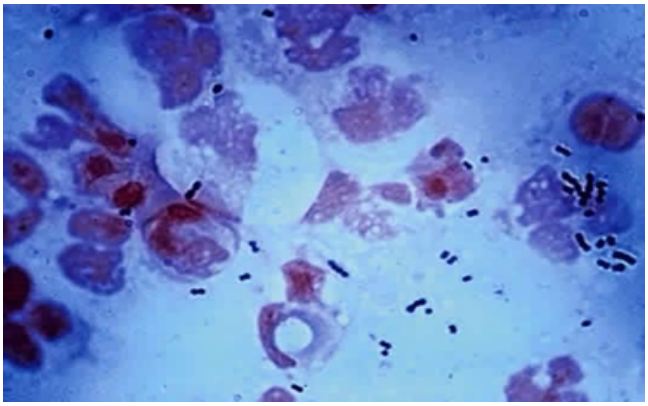

Figure 1: Gram stain of corneal ulcer

The cornea was anaesthetized with 4% lignocaine, using sterile 21 gaugeneedle the floor and the edges

of the ulcer was scraped carefully. The scrapings were transferred on sterlile microscopic slides and culture media. They were subjected to Gram's staining and KOH staining. The culture media in which they were inoculated were blood agar plate, chocolate agar plate, Mac-Conkey's agar, Sabauraud's agar and thioglycolate broth. The antibiotic sensitivity tests were done on Mueller 1mm Agar or by Kirby Bauer disc-diffusion technique. In case of perforated ulcers, the conjunctival swabs were taken to inoculate from the discharge. Routine blood tests were done for all patients such as complete haemogram, HIV Elisa and random blood sugar. In case of sac infection, sac excision was done. In diabetics, blood glucose was managed regularly by the physician. In selected cases where perception of light was present, keratoplasty was done.

Results

The Fallowing Observations were made from the present**,** clinical and microbiological study of bacterial corneal ulcer at NMCH, Patna, and the results are tabulated.

Table 1: Age distribution of study subjects

Age group	N (%)
20-40 yrs.	8 (22.9)
41-60 yrs.	19 (54.3)
>60 yrs.	8 (22.9)
Total	35 (100)

In present study bacterial corneal ulcers accounted to 22.9% in 20-40 yrs age group, 54.3% in 41-60 yrs age, 22.9% in above 60 yrs of age group. This table shows that majority of patients were in the age group of working population. I.e, from 41-60 years.

Table 2: Distribution of study subjectswith bacterialcorneal ulcer according to gender

Gender	N (%)
Male	27 (77.1)
Female	8 (22.9)
Total	35 (100)

In the present study males accounted 77.1% and females accounted 22.9%. Hence males were affected more than females.

Table 3: Distribution of study subjects with bacterialcorneal ulceraccording to occupation

Occupation	N (%)
Unemployed	12 (34.3)
Farmer	6 (17.1)
Coolie	8 (22.9)
Housewife	7 (20)
Student	2 (5.7)
Total	35 (100)

The above table shows that most of the patients were unemployed (34.3%), followed by coolie (22.9%), housewife (20%), farmer (17.1%), student (5.7%).

Table 4: distribution of study subjects with bacterialcorneal ulceraccording to place of residence

Residence	N (%)
Rural	26 (74.3)
Urban	9 (25.7)
Total	35 (100)

In the present study 74.3% patients belonged to rural area and 25.7% belongedto urban area. Majority of them were from rural area.

Table 5: Distribution of study subjects according tocomplications of corneal ulcer

Complications	N (%)
Adherent leucoma	4 (11.4)
Ant. staphyloma	1 (2.9)
perforation	6 (17.1)
Leucomatous grade opacity	11 (31.4)
Macular grade opacity	6 (17.1)
Nebular grade opacity	7 (20)
Total	35 (100)

In the present study, most common complication found was leucomatousgrade opacity (31.4%), followed by nebular grade opacity (20%), macular grade opacity. Corneal perforation was seen in (17.1%) cases.11.4% cases had developed adherent leucoma and 2.9% cases had developed anterior staphyloma.

Table 6: Distribution of study subjects according tooutcome (vision) at the end of follow up

Final outcome (Vision)	N (%)
Improved	17 (48.6)
No change	15 (42.9)
Deteriorated	3 (8.6)
Total	35 (100)

In the present study, at the end of follow up, vision, improved in 48.6% cases, deteriorated in 8.6% cases and no change had been noticed in 42.9% cases.

Table 7: Distribution of study subjects according toresults of gram stain & final outcome (vision)

Final outcome (Vision)	Gram positive	Gram Negative	Total	Chi square test
Improved	14 (60.87)	3 (25)	17 (48.57)	P=0.04
No change/ Deteriorated	9 (39.13)	9 (75)	18 (51.43)	**(Significant)**
Total	23 (100)	12 (100)	35 (100)	

In the present study, vision, improved in 60.87% patients with Gram positive bacterial ulcers and 25% Gram negative bacterial corneal ulcers. 39.13% Gram positive and 75% Gram negative corneal ulcers showed no change in vision or deteriorated.

Discussion

Among the 70 corneal ulcers 35 were found to be of bacterial aetiology. So the prevalence of bacterial corneal ulcers was more than fungal in the present study. Which is comparable with Shashi Gandhi1 et al[5] study, where bacterial corneal ulcers were more than fungal corneal ulcers. In M et al[2] study, bacterial and fungalinfections occur in equal numbers. In this study the commonest age group affected was between 41-60 years of age, followed by 20-40 years and >60 years. This is in agreement with Shashi Gandhi et al [5] study And M Srinivasan et al [8] study. This has a considerable socioeconomic impact because this age group people are bread winners of the family.

Regarding the gender, in the present study males accounted 77.1% and females accounted 22.9%. Hence males were affected more than females. In the other study, conducted by Usha Gopinathan at al, [9] male to female ratio of patients was 2.25:1. In Narsani AK et al [12] study, males accounted for 64.99%. By the nature of their work profile, men are more involved in outdoor activities which predispose themto various types of injuries. This study shows that most of the patients of bacterial corneal ulcer were unemployed 34.3% followed by coolie 22.9%, housewife 20%. Farmers contributed 17.1%, student 5.7%. In M Srinivasan et al [8] study agricultural worker/farmer contributed to 56.4%, housewife/domestic workers 12%, labourer 10.4%, tradesman/profession 8.1%, student/ child 6.7%, unemployed/ unknown 6.4% Patients.

Corynebacterium spp 14.5%, Nocardia spp. 1.8%, Bacillus spp. 1.1%, Propione- bacterium spp. 0.8%, Mycobacterium spp. 0.4%, Other bacilli 0.1% Gram-negative cocci 0.4% Branhamella catarrhalis 0.2% Neisseria spp. 0.2% Brevibacterium spp. 0.03% Gram-negative bacilli, 17.5% Pseudomonas aeruginosa, 9.7% Pseudomonas spp. 2.3% Moraxella spp. 1.4%, Haemophilus spp. 1.0%, Acinetobacter spp. 0.6%, Enterobacter spp. 0.5%, Aeromonas spp. 0.4%, Klebsiella spp. 0.4%, Escherichia coli 0.3%, Proteus spp. 0.2%, Alkaligenes fecalis 0.1%, *Flavobacterium spp.* 0.1% and other gram-negative bacilli 0.4%. In the present study, 77.1% samples were sensitive to moxifloxacin and cefazolin, 62.9% cases were sensitive to ofloxacin, 54.3% for gentamycin, tobramycin and gatifloxacin,31.4% sensitive to ciprofloxacin, 28.6% sensitive to levofloxacin and 2.9% for chloramphenicol. In Jayaraman Kaliamurthy et al [13] study, 70% to 76% of Gram-positive organisms (*Staphylococcus spp. and S. pneumoniae*) were susceptible to ciprofloxacin, of these, a comparatively low percentage of *S. epidermidis* isolates were susceptible to ciprofloxacin. Similarly, 69.6% of *S. epidermidis* and 73.4% of *S. aureus* isolates were susceptible to moxifloxacin, the 4th generation fluoroquinolone. Whereas 86.5% of *S. pneumonia* was susceptible to moxifloxacin. However, 94% to 98% of *Staphylococci* and 95% *S. pneumoniae* were susceptible to gatifloxacin. Where in 80% of *Coagulase negative staphylococcus* were found to be susceptible to newer-generation fluoroquinolones. Another study done by Jhanji et al, from India, reported a case of keratitis due to *Coagulase negative staphylococcus,* where the isolated bacterium was found to be resistant to moxifloxacin, gatifloxacin, ciprofloxacin, and cefazolin, in vitro and also clinically resistant to moxifloxacin. In the present study, out of 35 cases, fluroquinolone monotherapy was used in 25 cases (71.4%) and fortified antibiotics were used in 7

cases (20%), aminoglycosides were used in 3 cases (8.6%).

In the present study, out of 35 cases, 24 cases (68.6%) were treated with same antibiotics as initiated at the time of presentation and 11 cases (31.4%) were treated with change of antibiotics. Among the change of antibiotics, 14.3% were treated with Fort. Tobramycin, 5.7% cases with Fort. Gentamycin and Moxifloxacin, 2.9% cases were change over to Fortified cefazolin and ciprofloxacin eye drops. In the present study, most common complication found was leucomatous grade opacity (31.4%) followed by nebular grade opacity (20%), macular grade opacity and corneal perforation was seen in (17.1%) cases.11.4% cases had developedadherent leucoma and 2.9% cases had developed anterior staphyloma.

In the present study, at the end of follow up vision, improved in 48.8% cases, deteriorated in 8.6% cases and no change had been noticed in 42.95 cases. That is vision, improved in 60.87% patients with Gram positive bacterial ulcers and 25% Gram negative bacterial corneal ulcers. 39.13% Gram positive and 75% Gram negative corneal ulcers showed no change in vision or deterioration.

Conclusion

In the present study, out of 35 cases, fluroquinolone monotherapy was used in 25cases (71.4%) and fortified antibiotics were used in 7cases (20%), aminoglycosides were used in 3 cases (8.6%). At the end of 4 weeks from presentation, most common complication found was leucomatous grade opacity (31.4%), followed by nebular grade opacity (20%), macular grade opacity and corneal perforation was seen in (17.1%) cases.11.4% cases had developed adherent leucoma and 2.9% cases had developed anterior staphyloma and vision, improved in 48.8% cases, deteriorated in 8.6% cases and no change had been noticed in 42.95 cases.

These findings have important public health importance for the treatment and prevention of corneal ulcers in the developing countries.

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