



RESEARCH ARTICLE

A STUDY OF THE PATTERN AND CONTRIBUTORY FACTORS OF CORNEAL ULCERS IN UTTAR  
PRADESH AND BIHAR STATES OF INDIA

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ABSTRACT

The paper aims to study the factors responsible for the incidence and promotion of corneal ulcers in the parts of eastern Uttar Pradesh and Bihar states of India. 248 patients with corneal ulcers were included in this prospective study from among the patients attending the out patient department of department of ophthalmology of a tertiary care hospital in India. All patients are drawn from the eastern parts of Uttar Pradesh and Bihar states. Patients with any other systemic and ocular diseases were excluded from this study, viral and protozoal corneal ulcers were also excluded. All patients underwent grams staining and potassium hydroxide staining of specimens, all specimens were plated and cultured. Staphylococcus aureus (20.56%) and staphylococcus albus (33.06%), along with pseudomonas and neisseria were bacterial pathogens detected, while fusarium (10.08%) was the chief fungal agent detected. Percentage occurrence in the age groups was the most in the 31-40 year (48.38%). Males (58.33%) were more affected with corneal ulcers than females (40.72%). Rural population (62.50%) was found to be more affected with corneal ulcers than urban (37.50%), illiterate(69.75%) more affected than literates(30.24%) and labourers(62.50%) more affected than house wives(37.50%), those with low socio economic status (71.31%) and poor hygiene (64.51%) more affected with corneal ulcers than in high socioeconomic status(28.62%) and better hygiene(35.48%). The burden of corneal blindness induced by corneal ulcers lies on the illiterate ,rural, population of eastern Uttar Pradesh and Bihar, and that too largely young and male patients. Agricultural workers especially labourers and those in poor socio-economic conditions and hygiene are more at risk. Prevention with antibiotics and education about the disease may be of help.

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INTRODUCTION

Corneal blindness constitutes a major public health problem in many developing countries [1]. India is a country where agriculture is the primary occupation; it has large number of ocular trauma cases. It has been estimated that corneal blindness may be responsible for 1.5 to 2.0 million cases of monocular blindness, of them corneal ulceration and ocular trauma are most common causes. The total estimated blind in the world are 45 million, cataract contributes nearly 20 million while trachoma blinds 4.9 million.[2]. There has been a worldwide decline in the cases of trachoma, leprosy and onchocerciasis due to the proper implementation of public health programmes. Studies have shown that the common causes of corneal blindness are ocular trauma, corneal ulceration, and the use of traditional eye medicines containing steroids ,[3][4] It was found in a study that the annual incidence of corneal ulceration in Madurai District in South India was 10 times the annual incidence from Minnesota, in the United States of America[5]. Considering the incidence of Madurai and applying it to whole of India, it can be estimated

that 8, 40,000 people develop a corneal ulcer annually. Corneal ulcers occur commonly to farmers, labourers, motorcycle riders and malnourished children; it appears more frequently in elderly, debilitated, atherosclerotic and anaemic persons. Lower Socio-economic strata and ignorance to the disease are contributory to the ulcers. The ulcers are more common in the harvest season. Prompt assessment of the ulcer form and microbiological examination are the most important tool in managing such ulcers. The prompt reporting by the microbiologist allows the ophthalmologist to initiate exact therapy for the infectious eye disease. The aim of this study is to analyze the factors responsible for the incidence and promotion of corneal ulcers in this region of India, that is the eastern part of the state of Uttar Pradesh & Bihar which are relatively backward and the patients are largely drawn to, a tertiary care referral hospital no study has been done in this area ,studies have been done largely in and around Delhi in northern India.

MATERIAL AND METHODS

- (i) Selection of Cases and parameters studied- Cases were selected from the outpatient department of

ophthalmology, during the period of September 2008 to January 2010. A total of 248 cases of corneal ulcer were studied. Viral and protozoa ulcers have been excluded from this study due to lack of availability of identification techniques. Patients associated with any other systemic or ocular illness or with any previous surgery or ocular medication was excluded. We studied 248 cases of corneal ulcers with bacterial, fungal, and trauma as underlying pathologies and with corneal ulcer cases using various parameters (epithelial defects sizes, aetiologies, therapy, response and factors like literacy and socioeconomic status).

(ii) Gram staining and Potassium hydroxide (Koh) Examination-Recording of a detailed history and examination and the size and extent of the ulcer was done in a Performa and also the outpatient slip for future reference. Topical Proparacaine drops are instilled in the patient's diseased eye, while the patient is sitting on the slit lamp bio microscope a sterilized number 15 surgical blade is used to scrape the ulcer from the edges and the floor after the removal of overlying discharge. Scrapping material is now transferred on to the sterilized glass slide.

**Table 1. Distribution of corneal ulcers patients according to epithelial defect size (in millimetres (mm))**

Socio Demographic Variables	Ulcer size (in mm)			Total (%)	Chi-square Test of Association
AGE (in years)	<2x2	(2x2)-(5x5)	>5x5		
≤30	30	10	40	80 (32.25%)	$\chi^2=24.47$
31-40	21	51	48	120(48.38%)	Df=2
≥41	11	12	25	48 (19.35%)	Significant (p<0.001)
Total	62	73	113	248	
SEX					$\chi^2=35.57$
MALE	51	24	72	147(59.27%)	Df=2
FEMALE	11	49	41	101(40.72%)	Significant (p<0.001)
Total	62	73	113	248	
AREA					$\chi^2=24.12$
RURAL	51	51	53	155(62.50%)	Df=2
URBAN	11	22	60	93 (37.50%)	Significant (p<0.001)
Total	62	73	113	248	
EDUCATION					$\chi^2=86.74$
LITERATE	20	22	33	75 (30.24%)	Df=2
ILLETERATE	42	51	80	173(69.75%)	Significant (p<0.001)
Total	62	73	113	248	
OCCUPATION					$\chi^2=18.56$
HOUSEWIFE& OTHERS (children and students)	23	10	60	93 (37.50%)	Df=2
Agriculture/Labourer	25	55	75	155(62.50%)	Significant (p<0.001)
Total	48	65	135	248	
SOCIO-ECONOMIC STATUS					$\chi^2=28.40$
LOW	32	57	88	177((71.31%)	Df=2
MIDDLE	30	16	25	71(28.62%)	Significant (p<0.001)
Total	62	73	113	248	
HYGIENE					$\chi^2=16.82$
POOR	33	60	67	160(64.51%)	Df=2
GOOD	29	13	46	88(35.48%)	Significant (p<0.001)
Total	62	73	113	248	

**Table 2. Distribution of hypopyon ,perforation and pannus in corneal ulcer cases**

Complications	Number	% of cases
Hypopyon	13	27.78
Perforation	8	16.66
Pannus	7	14.68

**Table 3. Distribution of corneal ulcers in relation to the aetiological agent identified microbiologically and its drug sensitivity pattern**

	microorganisms	Number	%	DRUG SENSITIVITY PATTERN
A. Bacteria	<i>Staphylococcus aureus</i>	10	20.33	Chloremphenicol,gentamycin,amikacin tobramycin, erythromycin, trimethoprim.
	<i>Staphylococcus albus</i>	16	33.33	Chloremphenicol,gentamycin erythromycin,trimethoprim,tetracycline
	<i>Pseudomonas aeurogenosa</i>	5	10.41	Gentamycin,amikacin,netilmycin
	<i>Nesseria catarrhalis</i>	1	2.03	Streptomycin ,gentamycin, ciprofloxacin, norfloxacin, chloremphenicol
Total		22	45.83	
B. Fungus	<i>Fusarium</i>	5	10.41	-
C.	<i>Aspergillus fumigatus</i>	3	6.25	-
	No pathogen detected	18	37.50	-
Total		48	100.00	-

These are now examined for gram staining and Koh examination in our department laboratory. Treatment is started empirically with the fortified antibiotic drops in severe graded ulcers and topical Fluoroquinolones in mild and moderate graded cases with the possible bacterial or fungal diagnosis in mind.

- (iii) Taking corneal smear for culture and sensitivity- According to the species that are commonly found in ocular infections specially corneal ulcers we need blood agar, chocolate agar, nutrient agar, thioglycollate broth, brain heart infusion broth for bacterial culture and Sabourauds dextrose agar for fungi culture[6]. The scrapping were gently applied as a 'C' streak on the solid media and dipped in liquid media.
- (iv) Culture Techniques -Plating out a specimen for single colonies
1. We Label agar plate with patient name, identification number and date.
  2. Inoculate agar plate with material from corneal scrape.
  3. Flame loop until it is red hot, then allow cooling (15-20 seconds).
  4. Holding the agar plate close to the convection currents of the Bunsen flame, streak the loop from the original inoculum.
  5. Sterilize the loop allow cooling and streaking out pattern to produce pattern 'C'.
  6. Repeat step 4.

## RESULTS

The age distribution in corneal ulcer cases were maximum in the age group  $\leq 30$  years (33.33%) and 31-40 years (48.38%). The youngest patient in the corneal ulcer cases was 12 years while the oldest one was 65 years old. The sex distribution of corneal ulcer cases showed male predominance. Approximately 58.33% were males in the corneal ulcer cases, Significance observed with respect to sex is  $p < 0.005$  and thus it is correlated with incidence of corneal ulcer cases in males. It was found that severe grade ( $\geq 5 \times 5$ mm) epithelial defects were maximum (45.56%) in corneal ulcers and then moderate ( $\geq 2 \times 5$ mm) grade (29.43%) and mild grade ( $< 2 \times 5$ mm) (25.00%). 155 cases belong to the rural areas as compared to 93 cases of urban areas. A majority of corneal ulcer cases are illiterate (78.3%). Most of the corneal ulcer cases were engaged in agriculture occupation wise. The non-agriculture and agricultural labourers constituted (62.50%) were more effected by corneal ulcers when compared to housewives, students and children put together (37.50%). The maximum number of corneal ulcer cases belonged to low socio-economic status (71.31%) due to increased malnutrition and poor hygiene in this group as predisposing factors.  $p < 0.05$ . Corneal ulcer cases were common in poor hygiene patients (64.51%). Hypopyon was present in 27.78% cases, while perforation and pannus were present in 16.66% and 14.51% cases respectively. Most common microorganisms in our set up was bacterial (45.34%) followed by fungal (16.66%) in causation of corneal ulcers. Among bacteria commonest was staphylococcus aureus and albus (20.56% & 33.06% respectively) followed by pseudomonas (10.08%) and Neisseria Cattarhalis (10.08%). Among fungi, the most common was *Fusarium* (10.41%) followed by *Aspergillus Fumigatus* (6.04%). Staphylococcus was found to be sensitive

to Chloremphenicol, Gentamycin, Amikacin, Tobramycin, Erythromycin and Trimethoprim. Staphylococcus albus was susceptible to chloremphenicol, erythromycin, tetracycline, trimethoprim and gentamycin. Pseudomonas was sensitive to gentamycin, amikacin and netilmycin. Neisseria cattarhalis was sensitive to Ciprofloxacin, Norfloxacin and Chloremphenicol (Tables 1, 2&3)

## DISCUSSION

The world health organisation currently estimates, there are 161 million persons world Wide with visual impairment, which includes 37 million blind i.e. visual acuity  $< 3/60$  in the better eye. [7]. An emphasis on managing the backlog of cataract surgery in developing country like India forces other causes to take a back seat. Lewallen, Courtright and others [8] have reported in a study expanding to four countries of Africa that among the major causes of visual loss in children, corneal scar and pthysis are responsible for around 19% of the total childhood blindness. In this study the higher incidence of corneal ulcers in the age group  $\leq 30$  and 31-40 years is due to the fact that they are the working population (outdoor workers) and more prone to corneal injury in day to day life. Males are more affected than females, the imbalance is probably due to disproportionate attendance in the hospital, despite increased awareness, and female patients tend to be ignored by the family members or report late for consultation also because males are outdoor workers and are more exposed. The incidence of severe grade corneal ulcers is more as compared to moderate and mild grades, this indicates either a delay in the treatment or inadvertent use of easily available steroid eye drops in the form of traditional medicines. Most of the ulcer cases belonged to rural areas ( $p < 0.001$ ) as poverty, ignorance, and malnutrition are prevalent in villages. Additionally adequate medical facilities still lack in the rural areas. Rural and illiterate patients are more affected; this suggests that habitation and educational status has got significant impact on corneal ulcer predisposition [9]. Farmers are more affected compared with housewives, labourers students and children put together. The data clearly depicts the agriculture based economy of India. P-value reaches  $< 0.05$  and thus is significant with respect to occurrence of corneal ulcers. Socio economic factors happen to be one of the influencing factors in this study as patients living in the low socio-economic strata are more involved. Poor hygiene is one of the important pre-disposing factors for infection. Various other clinical features of corneal ulcer cases like Pannus, Hypopyon and Perforation were also considered, suggesting that a good percentage of patients could either not get treatment at all or were treated with topical steroids along with other drugs.. Chloremphenicol is the antibiotic for which the bacteria isolated were sensitive besides others like amino glycosides, erythromycin and trimethoprim. The Bhaktapur Eye Study of Nepal had suggested prophylactic chloremphenicol as a useful option [9]. Drug sensitivity to fungus was not done. On comparing to studies in the western world, bacteria are still the commonest cause, but predispositions are different, Youhanna William Ibrahim et al [10] in "The ports mouth corneal ulcer study" found that the gram positive bacteria accounted for 71.1% cases while gram negative for 28.9%, Acanthamoeba predominates in contact lens wearers, only 1.9% had poor visual outcome. Nakabayashi Jo et al [11] in a study at the saga medical

school, Japan report the predisposing factors for corneal ulcers to be predominantly foreign bodies in the eye, contact lens use and corneal scratches. Comparing to studies in India, J.S.Titiyal and others [12] identify the leading causes to be outdoor occupation, illiteracy, excessive alcohol, foreign body and trauma with vegetative matter, delay in starting initial treatment and failure to start fortified antibiotics.

### Conclusion

The burden of corneal blindness induced by corneal ulcers lies on the illiterate, rural, population of eastern Uttar Pradesh and Bihar, and that too largely young and male patients. Agricultural workers especially labourers and those in poor socio-economic conditions and hygiene are more at risk. Prevention with antibiotics and education about the disease may be of help, this has also been shown by several studies [13][14].

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