Socio-Demographic Characteristics of Patients with Ocular Infection in Northern India

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ABSTRACT

BACKGROUND: The microbiological and epidemiological patterns seem to vary with the patient population, site of infection, geographic location and it may also change over time. Hence, an understanding of the epidemiological features, risk factors and etiological agents that occur in a specific region are important in rapid recognition, timely institution of empirical therapy, optimal management and prevention of these infections. **OBJECTIVE:** To study association of various socio-demographic factors with ocular infections and microbiological positivity rates of collected samples at our tertiary care centre. **METHODS:** This study was conducted in the Department of Microbiology & Institute of Ophthalmology, Jawaharlal Nehru Medical College, Aligarh Muslim University (A.M.U.), Aligarh from July 2018 to February 2021. **RESULTS:** Out of 350 patients diagnosed with ocular infections in the study, 207(59.14%) were male patients, and 143 (40.8%) were female. Similar number of patients presented in each group. The clinical diagnosis of the infective conditions of the eye ranged from mostly innocuous Conjunctivitis to sight threatening Corneal ulcers and Endophthalmitis. The overall culture-positivity rate for bacterial isolation was 54.57% (191/350). **CONCLUSION:** There is slight gender preponderance towards males for infective ocular conditions**.** In this study, the most prevalent clinical condition was ocular adnexal bacterial infections, followed by corneal ulcers. From 350 patients with ocular infections, 54.57%

were culture-positive. Our study provides pattern of different ocular infections in OPD and IPD settings which may be may be of use to clinicians in their day to day practice.

Keywords: Ocular infections, Culture, Sociodemographic Demographic Characteristics

Introduction

The eye is largely immune to external agents. The numerous mechanical, anatomical, immunologic, and microbiological elements work together to prevent ocular infections and prevent pathogenic micro-organisms from surviving in the eye.[1-2] However, under certain conditions, micro-organisms manage to get past all the defenses and enter the eye, where they can then cause a variety of infections, from minor eye irritation to serious sight threatening infections like endophthalmitis. The bacteria that colonize the eye differ from those that do so in other areas of the body.[3] There is a risk of bacterial, fungal, viral, and parasite infections in the outer layer of the eye. Additionally, bacteria can get inside the eye and harm its interior structures, which frequently causes varying degrees of vision loss. Both exogenous or endogenous factors may be the cause of an eye infection.[4] External bacterial infections of the eye are usually localized but may frequently spread to adjacent tissue, from the conjunctiva to the cornea, the inner eye, the orbit and the brain. The conjunctival sac and lid margins of the eye harbor a variety of micro-organisms and the bacteria present in the conjunctival sac form a constant source of infection to other parts of the eye. Conjunctivitis, keratitis, blepharitis, canaliculitis, dacryocystitis, external hordeolum, and cellulitis are all clinical manifestations of external eye infections.[5] Bacteria frequently produce the clinical signs and symptoms of ocular inflammation. Globally, Gram-positive bacteria are the predominant cause of these purulent infections. Organisms frequently isolated are *Haemophilus influenzae, Streptococcus pneumoniae, Staphylococcus aureus, and Staphylococcus epidermidis*.[6] However, the margins of the lids and conjunctival sacs of healthy individuals can also contain gram-negative pathogens.

The microbiological and epidemiological patterns seem to vary with the patient population, site of infection, geographic location and it may also change over time. Hence, an understanding of the epidemiological features, risk factors and etiological agents that occur in a specific region are important in rapid recognition, timely institution of empirical therapy, optimal management and prevention of these infections. The present study was conducted with the objective of studying the

association of various socio-demographic factors with ocular infections and microbiological positivity rates of collected samples at our tertiary care centre.

Materials & Methods

This study was conducted in the Department of Microbiology & Institute of Ophthalmology, Jawaharlal Nehru Medical College, Aligarh Muslim University (A.M.U.), Aligarh from July 2018 to February 2021. A total of 350 patients presented during the study period to the outpatient and inpatient departments of the Institute of Ophthalmology, JNMCH, AMU.

All the patients were examined under diffused torch light, followed by slit-lamp biomicroscopy by Ophthalmologists. Diagnosis was made clinically and appropriate specimen was collected for microbiological examination. The clinical specimens were processed in the laboratory. Direct microscopy of Gram-stained smear was performed for all the collected specimens, which were inoculated onto 5% sheep blood agar (SBA), chocolate agar (CA), MacConkey agar (MCA), Robertson cooked meat broth (RCM), thioglycolate medium, and brain-heart infusion broth (BHI). These were incubated at 37°C for 18-24 hours. The organism was identified based on morphology, culture characteristics, and biochemical tests.

The clinical findings, microbiological profile and sociodemographic information was documented on a pre-designed semi-structured questionnaire.

Data Management

The data so collected was entered in IBM SPSS version 20.0 software for analysis.

Ethics

Ethical clearance was obtained from the Institutional Ethics Committee, Jawaharlal Nehru Medical College, AMU, Aligarh. Informed consent was obtained from patients/guardians for their participation.

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Results

Out of 350 patients diagnosed with ocular infections in the study, 207(59.14%) were male patients, and 143 (40.8%) were female. The male-to-female ratio was 1.4:1 (Table 1). The distribution of

patients with respect to different age groups is presented in Table 2. Similar number of patients presented in each group.

Table 1. Distribution of patients according to sex (n=350)

Gender	Frequency (%)	Percentage (95% CI)
Male	207	59.2 (53.9-64.2)
Female	143	40.8 (35.7-46.0)

Table 2 Distribution of ocular infections according to age (n=350)

Age group (years)	Patients	Percentage (95% CI)
0-10	53	15.14% (11.5-19.3)
11-20	32	9.14% (6.3-12.6)
21-30	48	13.71% (10.2-17.7)
31-40	58	16.57% (12.8-20.8)
41-50	40	11.42% (8.2-15.2)
51-60	66	18.86% (14.8-23.3)
61-70	38	10.85% (7.8-14.6)
>70	15	4.28% (2.4-6.9)

The clinical diagnosis of these infective conditions ranged from mostly innocuous Conjunctivitis to sight threatening Corneal ulcers and Endophthalmitis. Conjunctivitis, Dacryocystitis, Endophthalmitis and Corneal ulcers were found to be the most common Ocular infections in our study. Conjunctivitis was more commonly seen in patients less than 20 years of age, and endophthalmitis and corneal ulcer were more common in elderly patients. Dacryocystitis cases mostly belonged to the middle age group of 21-50 years accounting for 45.2% of cases. No age predominance was observed for pre-septal and orbital cellulitis. Around half of patients with

Endophthalmitis (51.9%) and Panophthalmitis (50%) belonged to older age group of >50 years (Table 3).

Table 4 shows the bacterial culture positivity rate in different ocular infective conditions. The overall culture-positivity rate was 54.57% (191/350). The maximum culture positivity rate was found in Panophthalmitis, 04 (4/4; 100%) and post-surgical infection, 04(4/4; 100%), followed by Dacryocystitis, 50 (50/62; 80.64%) and internal hordeolum, 13 (13/21; 61.90%). More than half of Conjunctivitis (56.6%), Preseptal Cellulitis (60.0%) and External hordeolum (52.8%) were also culture positive. In Endophthalmitis, 23 of 81 patients (28.3%) were found to be culture positive.

Table 3: Pattern of various bacterial ocular infections in relation to age

Age Groups	**0-20 years N, % (CI)**	**21-50 years N, % (CI)**	**>50 years N, % (CI)**	**Total N, % (CI)**
Conjunctivitis	27, 50.9% (36.8-64.9)	16, 30.2% (18.3-44.3)	10, 18.9% (9.4-32.0)	53 (15.1%)
Corneal ulcer	04, 6.2% (1.7-15.2)	25, 39.1% (27.1-52.1)	35, 54.7% (41.7-67.2)	64 (18.3%)
External hordeolum	02, 5.5% (0.6-18.7)	32, 88.9% (73.9-96.9)	02, 5.5% (0.6-18.7)	36 (10.3%)
Internal hordeolum	03, 14.3% (3.1-36.3)	13, 61.9% (38.4-81.9)	05, 23.8% (8.2-47.2)	21 (6.0%)
Dacryocystitis	17, 27.4% (16.9-40.2)	28, 45.2% (32.5-58.3)	17, 27.4% (16.9-40.2)	62 (17.7%)
Preseptal cellulitis	05, 33.3% (11.8-61.6)	05, 33.3% (11.8-61.6)	05, 33.3% (11.8-61.6)	15 (4.2%)
Orbital cellulitis	04, 40% (12.2-73.8)	02, 20% (2.5-55.6)	04, 40% (12.2-73.8)	10 (2.8%)
Endophthalmitis	21, 25.9% (16.8-36.9)	18, 22.2% (13.7-32.8)	42, 51.9% (40.5-63.1)	81 (23.1%)

Panophthalmiitis	01, 25% (0.6-80.6)	01, 25% (0.6-80.6)	02, 50% (6.7-93.2)	04 (1.1%)
Post-surgical infection	01, 25% (0.6-80.6)	01, 25% (0.6-80.6)	02, 50% (6.7-93.2)	04 (1.1%)
Total (N)	85, 24.3% (19.9-29.1)	141, 40.3% (35.1-45.4)	124, 35.4% (30.4-40.7)	350

Table 4. Bacterial culture positivity rate of different ocular infections

Ocular infections	Patients	Bacterial isolates	Percentage (95% CI)
Conjunctivitis	53	30	56.6 (43.2- 69.9)
Corneal ulcer	64	31	48.4 (36.1-60.6)
External hordeolum	36	19	52.8 (36.4-69.0)
Internal hordeolum	21	13	61.9 (41.1-82.6)
Dacryocystitis	62	50	80.6 (70.8-90.4)
Preseptal cellulitis	15	09	60.0 (35.2-84.7)
Orbital cellulitis	10	08	80.0 (44.3-97.4)
Endophthalmitis	81	23	28.4 (18.33-37.7)
Panophthalmiitis	04	04	100
Post-surgical infection	04	04	100
Total	350	191	54.57 (49.3-59.7)

Discussion: In the present study, a total of 350 patients with clinically diagnosed ocular infections were studiedf. In our study 59.2% patients were males and 40.8% were females. Tilahun Aweke et al[7] (2014) in their study amongst 281 patients with external ocular infections reported that 59.4% patients were males and 40.6% were females. Amongst the various ocular infective conditions in our study, 34% (119/350) patients had ocular adnexal bacterial infections (External hordeolum, Internal hordeolum, Dacryocystitis), 15.14% (53/350) had Conjunctivitis, 18.28% (64/350) had corneal infections, 1.1% (4/350) had a post-surgical infection. The remaining 24.28% (85/350) had an infection of the intraocular tissues (Endophthalmiitis + Panophthalmitis). Belyhun Yeshambel et al[8] (2018) in their study among 210 patients of external ocular infections reported conjunctivitis in 32.9% (69), blepharitis in 26.7% (56), dacryocystitis in 14.8% (51), blepharoconjunctivitis in 11.9% (25), and trauma in 10.0% (21) of their patients. Tilahun Aweke et al[7] (2014) found 49.8% cases of Conjunctivitis, 19.6% Blepharitis, 11.03% cornral infections, 5.4% Dacryocystitis and 12.8% others.

Most of the endophthalmitis cases in our study were subsequent to cataract surgery, and cataract is the disease of the elderly population; this provides an explanation for more endophthalmitis cases in elderly people.

In our study, the overall culture-positive rate was 54.57 percent (191 out of 350). Bharathi JM et al.[9](2010) and Tilahun Aweke et al.[7] (2014) found a similar culture positivity rate of 58.8% and 48.8% respectively . Mohammed et al[10] also reported a similar rate of 60% (198/332) in 2020. Hemavathi et al. (2014)[11] conducted their study in Bangalore, India and it yielded 34.5% (81/235) of bacterial growth. The probability of isolating a causal organism is dependent on a number of variables, including the volume of inoculum[12], the site from which it is collected, the types of media utilised for culture (enriched or basic media)[13], and the empirical treatment received before the sample collection.[14] This can partially explain culture-positivity rate across centres. The difference can also be attributed to geographic location, study period, study population, socioeconomic condition of the study population, and laboratory method used to isolate microorganisms.

In our study, we found the highest culture positivity rate among the samples collected from panophthalmitis (100%; 4/4), post-surgical infections (100%; 4/4), and lacrimal apparatus

infections (Dacryocystis, 80.64%; 50/62). The possible reason might be that blockage of the nasolacrimal duct harbors a significant number of microorganisms resulting in significant recovery of bacteria in culture. We found positive culture in 56.6% cases of Conjunctivitis and 48.4% cases of Keratitis. Belyhun Yeshambel et al[8] (2018) reported that 32.8% (43), 23.7% (31), and 16.0% (21) of the isolates could be detected in conjunctivitis, dacryocystitis, and blepharitis, respectively and 27.5% (36) of bacteria were detected in other infections of the eye.

Conclusion: There is slight gender preponderance towards males for infective ocular conditions. In this study, the most prevalent clinical condition was ocular adnexal bacterial infections, followed by corneal ulcers. From 350 patients with ocular infections, 54.57% were culture-positive. Our study provides pattern of different ocular infections in OPD and IPD settings which may be may be of use to clinicians in their day to day practice.

Limitations

This was a hospital-based study at a tertiary care center and therefore it is subject to selection bias. The sample size of the study was small.

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