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Research Article

A STUDY OF THE PRESCRIBING PATTERN AND OUTCOME OF ANTIMICROBIALS IN INFECTIOUS EYE DISEASES IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: The study aimed to evaluate how often antimicrobials are prescribed to patients with infectious eye illnesses and assess the effectiveness of antibiotics in treating infectious eye diseases in the Department of Ophthalmology's outpatient clinic.

Methods: The study population consisted of 316 patients with different infectious diseases of the eye who attended the Ophthalmology Outpatient Department in a Tertiary Care Hospital. It was a cross-sectional prospective observational study. Non probability sampling method was used for the study. Data were collected in a questionnaire developed by the researcher which included age, sex, symptoms that the patient is experiencing, medications administered to the patient, route of administration of the medicines, dosage or strength of the medicines, daily frequency of administration, duration of treatment, and outcome following the end of the treatment. Data collected are entered in the Microsoft Excel 2016 software. Data are analyzed and summarized using descriptive and inferential statistics, and later presented in tables, bar diagrams, and percentages.

Results: Eighty-one patients (25.63%) had bacterial conjunctivitis, 27 (8.54%) had viral conjunctivitis, 9 (2.85%) had bacterial keratitis, 16 (5.06%) had viral keratitis, 8 (2.53%) had fungal keratitis, 14 (4.43%) had blepharitis, 6 (1.90%) had meibomitis, 33 (10.44%) had stye, 49 (15.51%) had dacryocystitis, 2 (0.63%) had canaliculitis, 5 (1.58%) had scleritis, 44 (13.92%) had episcleritis, 14 (4.43%) had uveitis, 6 (1.90%) had preseptal cellulitis, and 2 (0.63%) had orbital cellulitis. Two hundred and twenty-six patients (71.52%) received Moxifloxacin, 27 (8.54%) received Moxifloxacin and Loteprednol combination, 36 (11.40%) received Moxifloxacin and Dexamethasone combination, 20 (6.33%) received Acyclovir, 23 (7.28%) received Ganciclovir, 8 (2.53%) received Natamycin, 4 (1.26%) received Fluconazole, 4 (1.26%) received Itraconazole, 42 (13.30%) received Amoxicillin and Clavulanic Acid combination, 43 (13.60%) received Cefixime, 4 (1.26%) received Ciprofloxacin and 2 (0.63%) received a combination of Ceftriaxone and Sulbactam. None of the patients were administered Tobramycin (0%). Brand-name medications were prescribed for every patient (n=316) (100%). Among the 316 patients, 92 patients (29.11%) were also prescribed generic names of drugs. The total number of medicines in 316 prescriptions was 439. Three hundred and fifty-one medicines (79.95%) out of 439 medicines were prescribed from the National List of Essential Medicines, 2022. 117 medicines (26.65%) out of 439 medicines were prescribed from the 21st WHO Model List of Essential Medicines, 2019. It was seen that 279 patients (88.30%) had an improvement in their disease condition, 36 patients (11.40%) had no change in the existing disease condition and 1 patient (0.30%) had a deterioration of the disease condition.

Conclusion: Early treatment with proper medicines can reduce severe complications of infectious eye diseases, such as endophthalmitis, panophthalmitis, and blindness. This will establish a healthy society, which will help in increasing the productivity of the individuals thus leading to a prosperous future.

Keywords: Antimicrobials, Brand name, Deterioration, Eye infections, Ganciclovir, Generic name, Improvement, Moxifloxacin, Natamycin.

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INTRODUCTION

The eyes are very vital for the humans [1]. The sense of vision provided by the eyes has great importance in day-to-day functioning [2]. There are numerous types of ocular infections in people. The orbit, eyelid, external ocular surface, anterior segment, and posterior segment are commonly affected [3]. Identification of the offending organism or organisms, as well as knowledge of the mechanisms of action and therapeutic properties of various antimicrobials are necessary for the therapy of ocular infections [4].

A large number of researches have been conducted to study the prescribing patterns of physicians across the country [5]. The studies focus on prescribing practices and suggest rational use of medicines at all levels of the health-care delivery system. Thus, it is important to institute appropriate therapy on time to control the infections and hence minimize ocular morbidity [6-9]. The purpose of this research is to identify the prescription pattern and outcome of antimicrobials in different infectious eye diseases of various drugs to promote the well-being of the patient.

METHODS

Study design

The study population consisted of 316 patients with different infectious diseases of the eye who attended the Ophthalmology Outpatient Department in a Tertiary Care Hospital. It was a cross-sectional prospective observational study. Non Probability Sampling method was used for the study.

Study criteria

Inclusion criteria

- Patients suffering from infectious diseases of the eye attend the Outpatient Department of Ophthalmology
- Patients above 18 years of age, both male and female.

Exclusion criteria

- Patients admitted to the ward of the Department of Ophthalmology
- Patients below 18 years of age
- Patients suffering from non-infectious diseases of the eye.

Data collection

The data were collected through a questionnaire developed by the researcher. The respondents were well-versed in the intentions of the study. They had to give consent before admission to the study. The physical questionnaire was filled out by the researcher after the patient properly answered all the questions. The questionnaire consists of questions that include the hospital number, name, age, sex, religion, occupation, and symptoms that the patient is experiencing, disease suffered by the patient, medications administered to the patient, route of administration of the medicines, dosage or strength of the medicines, daily frequency of administration, duration of treatment, drug nomenclature, and outcome following the end of the treatment.

The following data are collected in a questionnaire form in consultation with the clinician:

a. Hospital number
b. Name
c. Age
d. Sex
e. Religion
f. Occupation
g. Symptoms experienced by the patient
h. Disease suffered by the patient
i. Medications administered to the patient
j. Route of administration of the medicines
k. Dosage or strength of the medicines
l. Daily frequency of administration
m. Duration of treatment
n. Drug nomenclature
o. Outcome after completing the treatment.

Data analysis and presentation

Data collected are evaluated by using Microsoft Excel 2016 software. Data are interpreted and summarized using descriptive and inferential statistics and later presented in tables, bar diagrams, pie diagrams, and percentages.

RESULTS

The study consisted of 316 patients.

There were 118 patients (37.34%) in the age category of 18–30 years, 149 patients (47.15%) in the age category of 31–50 years, 41 patients (12.98%) in the age category of 51–70 years and 8 patients (2.53%) above the age of 70 years.

There were 171 male patients (54.11%) and 145 female patients (45.89%).

The total number of medicines prescribed to 316 patients was 439.

The total number of antibacterials prescribed was 380 (86%), antivirals prescribed were 43 (10%) and antifungals prescribed were 16 (4%).

The different categories of antibacterials included Fluoroquinolones (n=293) (77%), Aminopenicillins and beta-lactamase inhibitors combination (n=42) (11%), Cephalosporins (n=43) (11%), and Cephalosporins and beta-lactamase inhibitors combination (n=2) (1%).

Different routes were used for administering the drugs.

Eye drops were used in all patients (n=316) (100%). Eye ointments were used in 248 (78.50%) patients, oral tablets in 97 (30.70%) patients, and intravenous injections in 2 (0.63%) patients.

Table 1: Symptoms and the number of patients (n) with percentage

Symptoms	Number of patients (%)
Pain in eyes	98 (31.01)
Itchy eyes	114 (36.08)
Foreign body	35 (11.08)
Photophobia	39 (12.34)
Burning in eyes	13 (4.11)
Redness of eyes	216 (68.35)
Lacrimation	177 (56.01)
Blurring of vision	57 (18.04)
Purulent discharge	108 (34.18)
Skin lesions	4 (1.26)
Fever	6 (1.90)
Complete visual loss	0
Swelling of eyelid	52 (16.45)
Gluing of cilia	14 (4.43)

Table 2: Disease and the number of patients (n) with percentage

Disease	Number of patients (%)
Bacterial conjunctivitis	81 (25.63)
Viral conjunctivitis	27 (8.54)
Bacterial keratitis	9 (2.85)
Viral keratitis	16 (5.06)
Fungal keratitis	8 (2.53)
Blepharitis	14 (4.43)
Meibomitis	6 (1.90)
Stye	33 (10.44)
Dacryocystitis	49 (15.51)
Canaliculitis	2 (0.63)
Scleritis	5 (1.58)
Episcleritis	44 (13.92)
Uveitis	14 (4.43)
Preseptal cellulitis	6 (1.90)
Orbital cellulitis	2 (0.63)
Total	316

Table 3: Antimicrobials and the number of patients (n) with percentage

Medicines	Number of patients (%)
Moxifloxacin	226 (71.52)
Tobramycin	0
Moxifloxacin+loteprednol	27 (8.54)
Moxifloxacin+dexamethasone	36 (11.40)
Acyclovir	20 (6.33)
Ganciclovir	23 (7.28)
Natamycin	8 (2.53)
Fluconazole	4 (1.26)
Itraconazole	4 (1.26)
Amoxicillin+clavulanic acid	42 (13.30)
Cefixime	43 (13.60)
Ciprofloxacin	4 (1.26)
Ceftriaxone+sulbactam	2 (0.63)

Table 4: Number of medicines prescribed from lists of essential medicines

Essential drugs list	National list	World Health Organization list
Total medicines prescribed	351	117
Percentage	79.95	26.65

Patients were prescribed multiple drugs having different categories of names.

Table 5: Outcome associated with the number of patients (n) and percentage

Outcome	Improved	Unchanged	Deteriorated	Total
Number of patients (%)	279 (88.30)	36 (11.40)	1 (0.30)	316

All patients were prescribed drugs using brand names (n=316) (100%). Among the 316 patients, 92 patients (29.11%) were also prescribed generic names of drugs.

Many patients received multiple antimicrobials in their prescriptions. There were different antimicrobials or antimicrobial drug combinations in the prescriptions.

One hundred and fifty-one prescriptions (47.78%) had one antimicrobial, 157 prescriptions (49.68%) had two different antimicrobials or antimicrobial drug combinations, and 8 prescriptions (2.53%) had three different antimicrobials in them.

There is a statistically significant correlation between age group and disease pattern (p=0.04); and gender and disease pattern (p=0.02).

DISCUSSION

In this study, most patients were in the age category of 18–50 years. This is similar to the study conducted by Dutta *et al*., 2014 and Dhali *et al*., 2016; where 60% of patients were between 16 and 45 years of age. There were fewer patients above the age of 50 years in this study [10,11]. However, studies by Ahluwalia *et al*., 2021, and Gangwar *et al*., 2011 showed that there were more patients above the age of 50 years. This corresponds to 87% and 57.41% respectively [12,13].

The number of males was more than females in this study. This is similar to studies conducted by Gangwar *et al*., 2011 (Male=56.33%; Female=43.66%), Dhali *et al*., 2016 (Male=68.6%; Female=31.3%), Dutta *et al*., 2014 (Male=53%; Female=47%), Ahluwalia *et al*., 2021 (Male=56%; Female=44%) and Kauser *et al*., 2018 (Male=52.7%; Female=47.3%) [10-14].

This study found that the major infectious disease suffered by the people was conjunctivitis. This was followed by dacryocystitis, episcleritis, keratitis, stye, blepharitis, uveitis, meibomitis, preseptal cellulitis, scleritis, canaliculitis and orbital cellulitis. This is similar to the studies of Gangwar *et al*., 2011 (conjunctivitis=13.17%; corneal ulcer=10.08%; dacryocystitis=2.08%; Stye <1%; blepharitis <1%), dhali *et al*., 2016 (conjunctivitis=20.16%; Corneal Ulcer=15.99%; Stye=6.33%; Blepharitis=4.33%; uveitis=1.33%), ahluwalia *et al*., 2021 (conjunctival pathology=4%; dacryocystitis=3%), and Kauser *et al*., 2018 (conjunctivitis=21.5%; stye=5.5%) [11-14].

The study by Dutta *et al*., 2014 showed that more patients suffered from stye compared to keratitis and dacryocystitis (stye=4.7%; keratitis=3.52%; dacryocystitis=2.35%) [10].

The study by Jadhav *et al*., 2013 had more patients of meibomitis followed by conjunctivitis, blepharitis, stye, keratitis, preseptal cellulitis and uveitis (meibomitis=31.94%; conjunctivitis=16.10%; blepharitis=12.72%; stye=8.83%; keratitis=4.67%; preseptal cellulitis=2.59%; uveitis=1.81%) [15].

The most commonly prescribed drugs were antibacterials followed by antivirals and antifungals. This pattern was also found in studies conducted by Gangwar *et al*., 2011 (antibacterials=34.16%; antifungals=4.75%; antivirals=6.71%), Jadhav *et al*., 2013 (antibiotics=43.11%), Biswas *et al*., 2001 (antibiotics=34.2%), Dhali *et al*., 2016 (antimicrobials=39.6%), Nehru *et al*., 2005 (antimicrobials=32.36%), Dutta *et al*., 2014 (antibiotics=54.11%; acyclovir=6%), Ahluwalia *et al*., 2021 (antibiotics=38.26%), Kauser *et al*., 2018 (antibacterials=91.8%; antivirals=6.2%; antifungals=1.4%), and Maniyar *et al*., 2011 [10-18].

Fluoroquinolones were the most common category of antibacterials prescribed according to this study followed by Cephalosporins, Aminopenicillins, and beta-lactamase inhibitors combination, Cephalosporins, and beta-lactamase inhibitors combination. Among the Fluoroquinolones and Moxifloxacin was commonly prescribed followed by Ciprofloxacin. This is similar to other studies, such as Jadhav *et al*., 2013 (Fluoroquinolone=60%; Penicillin=1.3%), Nehru *et al*., 2005 (Fluoroquinolones=62.5%), Dutta *et al*., 2014 (Fluoroquinolones=58.68%; Cephalosporins=5.79%), Ahluwalia *et al*., 2021 (Fluoroquinolones=76%), Kauser *et al*., 2018 (Fluoroquinolones=53.5%), and Maniyar *et al*., 2011 (Fluoroquinolones=82.1%), which showed extensive use of Fluoroquinolones [10,12,14,15,17,18].

Moxifloxacin was the most commonly prescribed antibacterial as per Kauser *et al*., 2018 (Moxifloxacin=53.5%) [14]. Jadhav *et al*., 2013 (Gatifloxacin=42.42%; Ciprofloxacin=19.91%; Moxifloxacin=15.58%) and Dutta *et al*., 2014 (Gatifloxacin=18.84%; Ofloxacin=17.39%; Moxifloxacin=11.59%; Ciprofloxacin=7.97%) found that Gatifloxacin was the most frequently prescribed among the Fluoroquinolones [10,15].

Nehru *et al*., 2005 (Ciprofloxacin=62.5%) and Ahluwalia *et al*., 2021 (Ciprofloxacin=76%) found that Ciprofloxacin was commonly prescribed among Fluoroquinolones [12,17]. Maniyar *et al*., 2011 found that Ofloxacin was the most widely used Fluoroquinolone. (Ofloxacin=66.14%) [18].

Acyclovir 3% Eye Ointment and Ganciclovir 0.15% Eye Ointment were given 5 times daily in this study. This is similar to the finding by Croxtall, 2011 where Ganciclovir ophthalmic gel 0.15% is given 5-times-daily for effective treatment in Viral Keratitis [19].

In this study, eye drops were used in the majority of patients followed by eye ointments, oral tablets, and intravenous injections. This is similar to studies done by Gangwar *et al*., 2011 (Eye Drops=81.92%; Eye Ointment=17.63%; Tablets=5.33%), Jadhav *et al*., 2013 (Eye Drops=79.51%; Ointments=15.23%; Tablets=2.57%), Nehru *et al*., 2005 (Eye Drops=60.15%; Eye Ointment=37.59%; Oral=2.26%), Kauser *et al*., 2018 (Eye Drops=72.6%; Eye Ointments=14.2%; Tablets=12.4%; Injections=0.3%), and Maniyar *et al*., 2011 (Eye Drops=65.81%; Eye Ointments=17.63%; Tablets=6.59%; Injections=0.76%) [13-15,17,18].

Studies were done by Biswas *et al*., 2001 (Eye Drops =76%; Tablets=10.9%; Eye Ointments=6.4%; Injections=0.1%), Dhali *et al*., 2016 (Eye Drops=57.14%); Tablets=14.28%; Eye Ointments=6.42%; Injections=2.14%), and Ahluwalia *et al*., 2021 (Eye Drops=24.80%; Injections=19.79%) found that eye drops were commonly prescribed followed by oral tablets, eye ointments and injections [11,12,16].

A great number of patients were prescribed brand names of drugs in the study. Generic names were prescribed to a lesser number of patients. This is similar to studies done by Gangwar *et al*., 2011 (Generic=26.04%; Brand=73.95%), Jadhav *et al*., 2013 (Generic=2.35%; Brand=97.65%), Biswas *et al*., 2001 (Generic=35%; Brand=65%), Dhali *et al*., 2016 (Generic=34.3%; Brand=65.6%), Nehru *et al*., 2005 (Generic=1%; Brand=99%), Dutta *et al*., 2014 (Generic=0%; Brand=100%), Kauser *et al*., 2018 (Generic=0%; Brand=100%), and Maniyar *et al*., 2011 (Generic=1%; Brand=99%) [10,11,13-18]. Ahluwalia *et al*., 2021 found that generic names were used more commonly compared to brand names while prescribing for a disease (Generic=66.21%; Brand=33.79%) [12].

In this study, the majority of patients were prescribed two different antimicrobials followed by a slightly lesser number who were

prescribed a single antimicrobial. A few patients were prescribed three different antimicrobials. This is similar to studies conducted by Biswas *et al*., 2001 (Two=27.43%; Three=24.38%), Ahluwalia *et al*., 2021 (Combination=46.46%; Monotherapy=45.45%) and Kauser *et al*., 2018 (n=1.8) [12,14,16]. Studies by Nehru *et al*., 2005 (One=48.18%; Two=30.90%; Three=11.36%), and Maniyar *et al*., 2011 (One=48.48%; Two=27.27%; Three=9.69%) showed that in the majority of cases one drug was prescribed to every patient [17,18]. Dutta *et al*., 2014 found that three drugs were prescribed to a large number of patients (One=25.88%; Two=20.78%; Three=34.51%) [10].

A great number of medicines were prescribed from the National List of Essential Medicines, 2022 while a far lesser number of medicines were prescribed from the 21st WHO Model List of Essential Medicines, 2019. Various studies by Jadhav *et al*., 2013 (National List=19.48%), Dutta *et al*., 2014 (National List=16.31%), Ahluwalia *et al*., 2021 (National List=27.82%), Kauser *et al*., 2018 (National List=40%) and Dhali *et al*., 2016 (National List=20%) showed that less number of drugs were prescribed from the National List of Essential Medicines [10,11,12,14,15].

CONCLUSION

In a developing country like India, many people suffer from infectious diseases. With the ever-increasing population and migration of people from rural areas to large cities in search of livelihood, there is a constraint on residential space. This promotes overcrowding and the growth of slums. Many insect vectors and stray animals can carry germs of different communicable diseases to these places. This combined with poor hygiene and food deficient in nutrients makes the person vulnerable to infectious diseases. The diseases can aggravate and lead to various complications. This holds true, also in the case of infectious diseases of the eye.

Hence, immediate treatment with proper medicines is a necessity. Timely intervention can reduce severe complications of infectious eye diseases, such as endophthalmitis, panophthalmitis, and blindness. The administration of antimicrobial drugs by the doctor will increase the cure rate. This will establish a healthy society which will help in increasing the productivity of the individuals thus leading to a prosperous future.

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AUTHOR CONTRIBUTIONS

Dr. Siddhartha Krishna Deka conceived the idea. Dr. Siddhartha Krishna Deka and Dr. Dwipen Khanikar did the literature search. Dr. Siddhartha Krishna Deka collected the data, did the statistical analysis and wrote the manuscript. Both authors approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors have no relevant conflicts of interest.

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