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## Original Research Article

# Study of prescription pattern of topical antimicrobials used for eye infections in ophthalmology

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## ABSTRACT

**Background:** The use of topical antibacterial medicines for the treatment of patients with infections in the eye has various advantages with some disadvantages. After literature search, I was unable to find a larger number of articles on eye infections, so I selected this study in this particular area.

**Methods:** It was observational cross-sectional study; 270 patients were enrolled who visited the Ophthalmology OPD with a diagnosis of eye infections.

**Results:** The mean age $\pm$ SD were 39.53 ( $\pm$ 16.30). The 40.37% patients were suffering from conjunctivitis. The most commonly prescribed dosage forms were eye drops 38.58% and eye ointment 30.37%. The medicines prescribed by generic name were 37.47% and by brand name 62.52%.

**Conclusions:** Total drugs prescribed were 451. Price variation of drugs is calculated by comparing the price of generic vs. branded drugs.

**Keywords:** Antimicrobial drugs, Eye infections, Price variation

## INTRODUCTION

Periodic evaluation of prescription patterns is necessary to detect ill-logical and inappropriate drug use in medical practice, which could compromise the therapeutic efficacy and safety of prescribed medicines. Rational drug use is the administration of medications to patients based on their clinical needs at the appropriate times and doses. Irrational drug use, such as over-prescribing, under-prescribing, or misuse, can put patient's health at risk while also wasting scarce resources in the health-care system. For helping prescribers in improving their prescribing practices, evaluation of prescribing patterns contributes to the safe use of medications.<sup>1</sup>

The marketing, distribution, prescription, and use of drugs in a society with an emphasis on their medical, social, and economic implications is referred to as drug utilization

study (DUS) by the world health organization (WHO). To increase therapeutic effectiveness and decrease the development of resistance, drug usage patterns must be examined on a regular basis.<sup>2</sup>

The conjunctiva, lid, and cornea are the most often affected areas of the eye, and ocular infection is brought on by pathogenic bacteria. Bacteria are the most common causal agents in eye infections, which can result in visual loss. Conjunctivitis, keratitis, blepharitis, and other clinical symptoms are frequently observed.<sup>3</sup>

The use of topical antibacterial medicines for the treatment of patients with eye infections has various advantages. Ophthalmic infections include conjunctivitis, eye allergies, stye, blepharitis, chalazion, corneal ulcer, keratitis, and endophthalmitis. They can damage a number of ocular anatomical structures and are brought on by a variety of microbiological organisms (viruses, bacteria,

fungus, and parasites). These infections are a major cause of morbidity and mortality throughout the world.

The ability to transfer large quantities to the infection site is the most visible among these. Topical therapy may be the only way to acquire therapeutic doses because epithelia act as a good barrier. Antibacterial ophthalmic medicines are commonly used topically to treat ocular infections such as conjunctivitis, blepharitis, and corneal ulcers. Particularly in cases of severe corneal infection, knowing the pharmacokinetics of medications used topically may help guide treatment regimens.<sup>4</sup>

After literature search, I was unable to find a larger number of articles on eye infections, so I selected this study to evaluate the prescription pattern of topical antimicrobial agents used in the eye infections patients in the outpatient department (OPD) of ophthalmology which are already prescribed by the ophthalmologist.

## METHODS

### Study design

The study was observational cross-sectional study.

### Study site

Study was conducted in MGM medical college, Kamothe, Navi Mumbai, out-patient department (OPD) of ophthalmology and pharmacology in tertiary care teaching hospital.

### Study duration

The duration of study was February 2021 – February 2022

### Sample size

The 270 patients in OPD of ophthalmology is calculated using statistics  $[S = Z^2 \times P \times (1-P) \div m^2]$

### Study population

Ophthalmic patients who confirmed to the specific Inclusion and Exclusion criteria were enrolled for the study.

### Inclusion criteria

Patients enrolling for this study should be of either gender and between the ages of 5 and 75, presenting with symptoms of an eye infection, additionally, the patients and their parents or guardians must consent to sign the necessary pre-informed consent form were included.

### Exclusion criteria

Patients excluded from this study belong to the following groups (Patients with eye co-existing conditions, post-

surgery patients, patients with ocular trauma, patients with glaucoma, patients and guardians who do not agree to sign the consent form).

### Study methodology

All of the data and completed prescriptions were collected on a pre-designed case record form. The patients visiting ophthalmology OPD were diagnosed for eye infections. These patients were recruited for study and the purpose was explained to them. The following information was gathered from the records:

*Demographic data of the patients:* Name, age, gender, occupation, OPD No., clinical complains, diagnosis and other information's.

*Prescription related information:* Name of drug, single or in combination, generic or brand names, route of drug administration, dose, dosage form, frequency of administration and total duration of treatment.

### Evaluation parameters

*Patients according to eye infections:* Conjunctivitis, meibomitis, stye, chalazion, mild meibomitis, keratitis, blepharitis, uvetitis and herpes zoster.

*Drugs according to various dosage form:* Eye drops, eye ointment, tablet and capsule.

*Drugs according to nomenclature:* Generic name and brand name.

*WHO prescribing indices:* Total number of drugs prescribed, percentage of drugs prescribed with generic name and percentage encounter prescribed antibiotics.

*Price variation:* Price variation of drugs is calculated by comparing the price of generic vs. branded drugs.

### Calculations

*The percentage of antimicrobials administered by generic name*

Purpose: To determine the prevalence of medications administered by generic name.

$$\text{Average} = \frac{\text{Number of drug prescribed by generic name}}{\text{Total number of drug prescribed}} \times 100$$

*The percentage of antimicrobials administered by brand name*

Purpose: To determine the prevalence of medications administered by brand name.

$$\text{Average} = \frac{\text{Number of drug prescribed by brand name}}{\text{Total number of drug prescribed}} \times 100$$

The percentage rise between generic and brand drugs is calculated (Price variation)

Purpose: To know the cost differences between generic and brand drugs.

$$\text{Average} = \frac{\text{Differences between generic and brand drugs price}}{\text{Generic drug price}} \times 100$$

The drugs were classified into six categories depending on percentage (%) range of price variation. These were as follows-Less than 0%, 0-25%, 25-50%, 50-75%, 75-100% and more than 100%.

### Statistical analysis

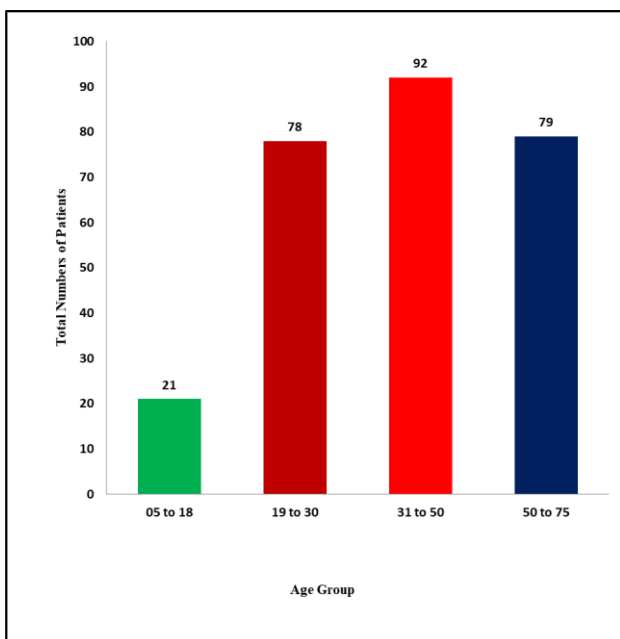
The data was entered and statistically analysed in Microsoft excel 2007. The mean, standard deviation, frequency, and percentage were used to describe the data.

## RESULTS

In this present study the details of 270 participants with eye infection were analysed.

### Age-wise distribution

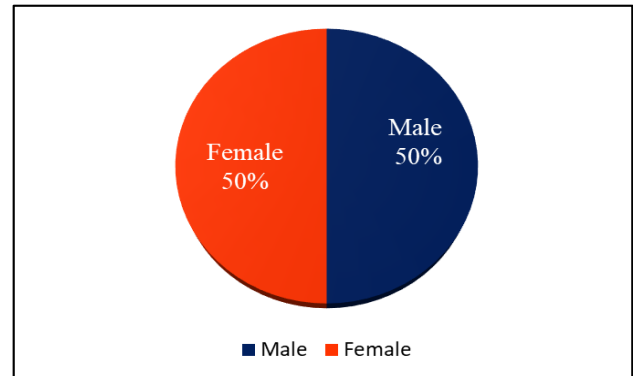
The mean age and  $\pm$ SD were 39.53 ( $\pm$ 16.30) and the median age was 38.5 with age range of 05 to 75 years, age distribution pattern is shown in (Figure 1). The most prevalent age group in which the majority of the patients were observed was 31 to 50 years, with 34.07%, followed by 50 to 75 years with 29.25%. The paediatric age group, which included patients 5 to 18 years had the few cases of eye infection with 7.77%.



**Figure 1: Age (in years) distribution of patients with eye infection.**

### Gender

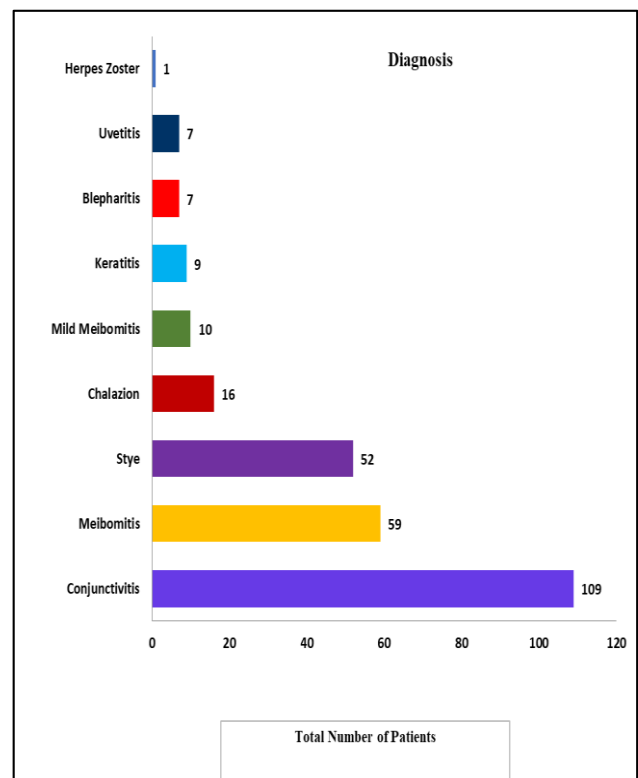
In this study, 135 patients (50%) were male and 135 (50%) were female. There was no significant gender difference observed in between two populations (Figure 2).



**Figure 2: Gender distribution of patients with eye infection.**

### Diagnosis

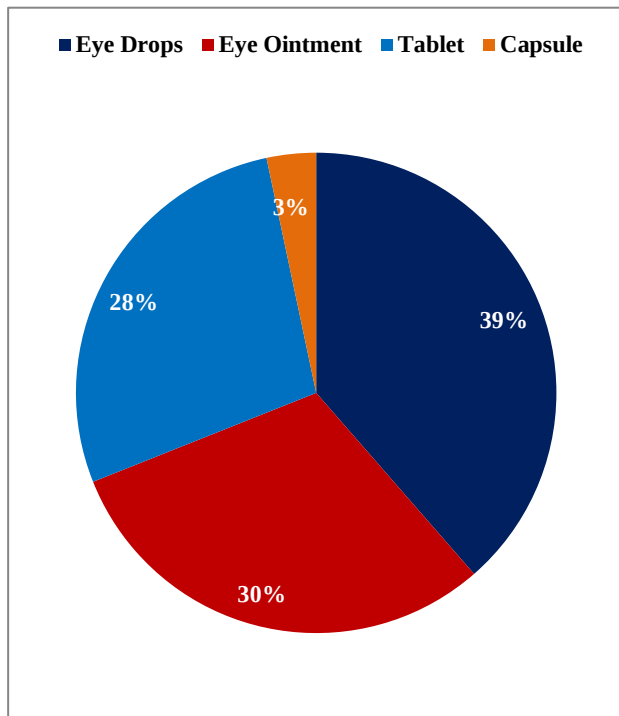
In this study found that 40.37% (109) patients were suffering from conjunctivitis followed by meibomitis 21.85% (59) patients, sty 19.25% (52) patients, chalazion 5.92% (16) patients, mild meibomitis 3.70 % (10) patients, blepharitis and uveitis 2.59% (7) patients and herpes zoster 0.37% (1) with only one patient (Figure 3).



**Figure 3: Diagnosis distribution of study participants.**

### Dosage form

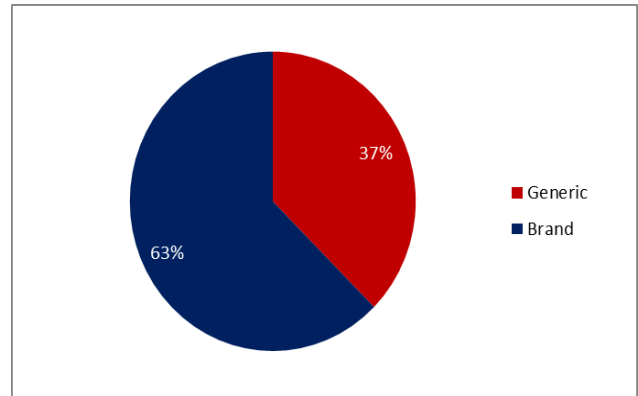
The most commonly formulation prescribed was eye drop (38.58 %) and eye ointment (30.37%), followed by tablet (27.71 %) and capsules (3.32 %) (Figure 4).



**Figure 4: Dosage form of given drugs.**

### Drugs prescribed by generic name or brand name

Out of the total medication prescribed, 37.47% was prescribed by generic name and 62.52% was prescribed by brand name (Figure 5).



**Figure 5: Drugs prescribed by generic or brand name.**

### Drugs prescribed for the eye infections

Different drugs prescribed for the eye infection patients are shown in Table 1. Total drugs prescribed were 451. Major drugs prescribed were moxifloxacin eye drop (41.11%) and chloramphenicol + polymyxin-B sulphate ophthalmic ointment (23.90 %) followed by amoxycillin + clavulanic acid and pantoprazole (11.08%).

### WHO core prescribing indices

Total numbers of drugs prescribed were 451. Percent of drugs prescribed by generic name was found to be 37.47%. Percent of encounters with antibiotic prescribed was found to be 11.30%. Price variation is calculated in this study by comparing price of generic vs. branded drugs to determine cost-effectiveness of drugs (Table 2 and 3). Price variation was found to be 6.89% in <0% category, 13.79% in 0-25% category, 25-50% category, and 50-75% category, 10.34% in 75-100% category and 41.37% in >100% category.

**Table 1: Drugs prescribed for the eye infections to study participants.**

| Drug name                                              | Dosage form | Number of drugs | Out of 270 patients (%) | Out of 451 drugs (%) |
|--------------------------------------------------------|-------------|-----------------|-------------------------|----------------------|
| Moxifloxacin                                           | Drops       | 111             | 41.11                   | 24.61                |
| Prednisolone                                           | Drops       | 06              | 2.22                    | 1.33                 |
| Homatropine hydrobromide                               | Drops       | 11              | 4.07                    | 2.43                 |
| Olopatadine hydrochloride ophthalmic solution 0.1% w/v | Drops       | 08              | 2.96                    | 1.77                 |
| Carboxymethyl cellulose sodium lubricant               | Drops       | 11              | 4.07                    | 2.43                 |
| Moxifloxacin+dexamethasone                             | Drops       | 01              | 0.37                    | 0.22                 |
| Sodium chloride ophthalmic solution                    | Drops       | 01              | 0.37                    | 0.22                 |
| Timolol 0.5%                                           | Drops       | 01              | 0.37                    | 0.22                 |
| Ciprofloxacin                                          | Drops       | 01              | 0.37                    | 0.22                 |
| Fluometholone ophthalmic suspension                    | Drops       | 01              | 0.37                    | 0.22                 |
| Loteprednl etabonate ophthalmic suspension             | Drops       | 03              | 1.11                    | 0.66                 |
| D-panthenol+sodium hyaluronate ophthalmic solution     | Drops       | 01              | 0.37                    | 0.22                 |
| Acyclovir                                              | Drops       | 07              | 2.59                    | 1.55                 |
| Brimonidine tartrate                                   | Drops       | 01              | 0.37                    | 0.22                 |

Continued.

| Drug name                                                       | Dosage form | Number of drugs | Out of 270 patients (%) | Out of 451 drugs (%) |
|-----------------------------------------------------------------|-------------|-----------------|-------------------------|----------------------|
| <b>Brimonidine tartrate+timolol maleate ophthalmic solution</b> | Drops       | 06              | 2.22                    | 1.33                 |
| <b>Nepafenac ophthalmic suspension</b>                          | Drops       | 01              | 0.37                    | 0.22                 |
| <b>Moxifloxacin + ketorolac</b>                                 | Drops       | 01              | 0.37                    | 0.22                 |
| <b>Loteprednl etabonate+ moxifloxacin ophthalmic suspension</b> | Drops       | 02              | 0.74                    | 0.44                 |
| <b>Chloramphenicol+polymyxin-B sulphate ophthalmic ointment</b> | Ointment    | 133             | 49.25                   | 29.49                |
| <b>Azithromycin eye ointment 1% w/w</b>                         | Ointment    | 03              | 1.11                    | 0.66                 |
| <b>Acyclovir eye ointment 3% w/w</b>                            | Ointment    | 01              | 0.37                    | 0.22                 |
| <b>Doxycycline and lactobacillus</b>                            | Capsule     | 15              | 5.55                    | 3.32                 |
| <b>Paracetamol, diclofenac sodium and serratiopeptidase</b>     | Tablet      | 16              | 5.92                    | 3.52                 |
| <b>Amoxycillin + clavulanic acid</b>                            | Tablet      | 50              | 18.51                   | 11.08                |
| <b>Pantoprazole</b>                                             | Tablet      | 50              | 18.51                   | 11.08                |
| <b>Metronidazole</b>                                            | Tablet      | 01              | 0.37                    | 0.22                 |
| <b>Levocetizine</b>                                             | Tablet      | 06              | 2.22                    | 1.33                 |
| <b>Vitamin B complex and B12</b>                                | Tablet      | 01              | 0.37                    | 0.22                 |
| <b>Vitamin A</b>                                                | Tablet      | 01              | 0.37                    | 0.22                 |

Table 2: Price variation of drugs prescribed for eye infection.

| Name of the drug                                                    | Dosage form | Cost of branded drug (Rs.) | Cost of generic drug (Rs.) | Price variation (%) |
|---------------------------------------------------------------------|-------------|----------------------------|----------------------------|---------------------|
| <b>Moxifloxacin</b>                                                 | Drops       | 167 (Milflox)              | 79 (Mahaflox)              | 111.39              |
| <b>Prednisolone</b>                                                 | Drops       | 180 (Lotepred T)           | 56 (Pred forte)            | 221.42              |
| <b>Homatropine hydrobromide</b>                                     | Drops       | 33 (Homide)                | 30 (Homatrapar)            | 10                  |
| <b>Olopatadine hydrochloride ophthalmic solution 0.1% w/v</b>       | Drops       | 180 (Olopat)               | 100 (Oldiga)               | 80                  |
| <b>Carboxymethyl cellulose sodium lubricant</b>                     | Drops       | 135 (CMC)                  | 83 (Lubistar CMC)          | 62.65               |
| <b>Moxifloxacin + dexamethasone</b>                                 | Drops       | 200 (Milflox)              | 13 (Mosi-D)                | 100                 |
| <b>Sodium chloride ophthalmic solution</b>                          | Drops       | 65 (Hypersol)              | 30 (Scos-5)                | 116.66              |
| <b>Timolol 0.5%</b>                                                 | Drops       | 67 (Timolet)               | 25 (Iotim)                 | 168                 |
| <b>Ciprofloxacin</b>                                                | Drops       | 17 (Ciplox)                | 10 (Cebran)                | 70                  |
| <b>Fluometholone ophthalmic suspension</b>                          | Drops       | 153 (FML)                  | 119 (Flurison)             | 28.57               |
| <b>Loteprednl etabonate ophthalmic suspension</b>                   | Drops       | 180 (Lotepred)             | 171 (L-Pred)               | 5.26                |
| <b>D-panthenol+sodium hyaluronate ophthalmic solution</b>           | Drops       | 257 (Maxmoist)             | 204 (Optidew)              | 25.98               |
| <b>Acyclovir</b>                                                    | Drops       | 48 (Acivir)                | 58 (Ocuvir)                | -17.24              |
| <b>Brimonidine tartrate</b>                                         | Drops       | 222 (Bidin LS)             | 10 (Brimodin)              | 122                 |
| <b>Brimonidine tartrate+timolol maleate ophthalmic solution</b>     | Drops       | 177 (Bidin-T)              | 15 (Brimocom)              | 77                  |
| <b>Nepafenac ophthalmic suspension</b>                              | Drops       | 320 (Nevanac)              | 150 (Nepastar)             | 113.33              |
| <b>Moxifloxacin + ketorolac</b>                                     | Drops       | 156 (Mahaflox-KT)          | 86 (Moxibert-KT)           | 81.39               |
| <b>Loteprednl etabonate + moxifloxacin ophthalmic suspension</b>    | Drops       | 191 (Ap Drops-LP)          | 28 (Goinx-LP)              | 582.14              |
| <b>Chloramphenicol and polymyxin-B sulphate ophthalmic ointment</b> | Ointment    | 109 (Ocupol)               | 63 (Simercetin)            | 73.01               |
| <b>Azithromycin eye ointment one percent w/w</b>                    | Ointment    | 137 (Zaha)                 | 95 (Himycin)               | 44.21               |
| <b>Acyclovir eye ointment 3% w/w</b>                                | Ointment    | 48 (Acivir)                | 58 (Ocuvir)                | -17.24              |
| <b>Doxycycline and lactobacillus</b>                                | Capsule     | 95 (Doxy 1)                | 55 (Doxyplus-LB)           | 72.72               |
| <b>Paracetamol, diclofenac sodium and serratio-peptidase</b>        | Tablet      | 139 (Enzoflame)            | 99 (Diclotin-plus)         | 40.40               |

Continued.

| Name of the drug                     | Dosage form | Cost of branded drug (Rs.) | Cost of generic drug (Rs.) | Price variation (%) |
|--------------------------------------|-------------|----------------------------|----------------------------|---------------------|
| <b>Amoxycillin + clavulanic acid</b> | Tablet      | 202 (Augmentin)            | 28 (Divimox-CV)            | 621.42              |
| <b>Pantoprazole</b>                  | Tablet      | 149 (Pan-40)               | 14 (Pazom-40)              | 964.28              |
| <b>Metronidazole</b>                 | Tablet      | 100 (Flagy 400)            | 21 (Metrogyl)              | 376.19              |
| <b>Levocetizine</b>                  | Tablet      | 47 (Levocet)               | 38 (Levoclan-5)            | 23.68               |
| <b>Vitamin B complex and B 12</b>    | Tablet      | 35 (Neurobione forte)      | 17 (B-Colex)               | 105.88              |
| <b>Vitamin A</b>                     | Tablet      | 8 (Vitamin A)              | 8 (Vitamin A)              | 0                   |

**Table 3: Price variation.**

| Category              | N  | Percentage (%) |
|-----------------------|----|----------------|
| <b>Less than 0%</b>   | 2  | 6.89           |
| <b>0-25%</b>          | 4  | 13.79          |
| <b>25-50%</b>         | 4  | 13.79          |
| <b>50-75%</b>         | 4  | 13.79          |
| <b>75-100%</b>        | 3  | 10.34          |
| <b>More than 100%</b> | 12 | 41.37          |
| <b>Total</b>          | 29 | 100            |

## DISCUSSION

The present study analysed 270 prescriptions from patients who came to ophthalmology OPD. During literature search, we were unable to find any comparable studies. The current study analyses topical antimicrobial trends in tertiary care hospital for the first time.

In the current study demographic data revealed that the majority of patients were between the age group of 31 to 50 years (34.07%) similar pattern shown by Suman et al (27.2%).<sup>5</sup>

The study enrolled 270 patients, with an average age of 39.53 ( $\pm 16.30$ ) and a median age of 38.5 years (range 05 to 75 years). Because 50% of our study participants were male and 50% of them were female, we found no difference in the prevalence of eye infections between the genders. Dutta et al discovered a consistent gender distribution pattern in their study, with 47% females and 53% males and in Jain et al discovered a consistent gender distribution pattern in their study, with 53% females and 47% males.<sup>1,6</sup>

According to the evaluations of 270 prescriptions, the majority of patients had diagnoses with conjunctivitis (40.37%) followed by meibomitis (21.85%), sty (19.25%), chalazion (5.92%), mild meibomitis (3.70%), blepharitis and uveitis (2.59%) and herpes zoster (0.37%). Conjunctivitis (40%) was the most commonly diagnosed disease in the previous study by Jain et al (50.34%) and Dutta et al (40%) and the current study evaluates conjunctivitis (40%) as the most commonly diagnosed disease.<sup>1,6</sup>

Out of total 451 drugs prescribed; the topical antimicrobial drugs were maximum (56.76%) followed by other drugs.

But topical antimicrobial drugs used in eye infection were not shown by any studies. Most commonly topical antimicrobial prescribed was moxifloxacin (eye drop) and ocupol (Chloramphenicol and polymyxin-b sulphate ophthalmic ointment) similar pattern shown by some previous studies of the ophthalmology department by Suman et al and Dutta et al where the medicine moxifloxacin eye drop is most commonly administered.<sup>5,6</sup>

Drugs prescribed by generic names were 37.47% and brand names 62.52%. According to Jain et al (98.7%), Topno et al (88.03%), Shakuntala et al (88.8%), Vaniya et al (57.4%), Pradeep et al (97.65%), Banerjee et al (83%) and Dhali et al (65.6%) drugs were mostly prescribed by brand name in their study and in Dutta et al study all drugs are prescribed by only brand name.<sup>1,2,4,7,11-13</sup>

Among 451 drugs, maximum drugs prescribed were eye drops (38.58%), followed by eye ointment (30.37%) and remaining were prescribed in tablet (27.71%) and capsule (3.32%) form. The study performed by Jain et al (85%), Shakuntala et al (69%), Kumar et al (53.08%), Suman et al (72%), Mohanty and Mohaptra (96.3%), Nehru et al (66.18%), and Mohammed et al (69%) showed larger number drugs prescribed in eye drops but tablet and capsule form was not prescribed in Topno et al and Shakuntala et al study.<sup>1,2,5,7,9,10,14,15</sup>

According to WHO core indices or indicators shows that total number of drugs prescribed were 451, out of which 37.47% percent of drugs prescribed with generic name and 11.30% percent encounter prescribed antibiotics (oral).

Since generic prescribing reduces the chance of prescription errors in both writing and reading, it is essential to prescribe drugs by their generic names only. Prescription writing and reading issues may result from

prescribing by brand names because the brand names of several drugs generally sound and spell similarly. Furthermore, because generic medications are less expensive than branded drugs, generic prescribing keeps treatment costs low and encourages rational drug use.<sup>9</sup>

As a result, we determined the increased medicine cost if the drugs are prescribed by brand name. The cost of drugs was observed to be increased in this study. In this study, the price variation of drugs is determined by comparing the costs of branded and generic drugs. Price variation was found to be 6.89% in the less than 0% category which means some of the drugs are higher in generic prices when compared to branded drugs. Whereas other drugs are having less cost in generic price when compared to branded drug price which is 13.79% in the 0-25% category, 25-50% category, and 50-75% category, 10.34% in the 75-100% category and 41.37% in the more than 100% category.

There are some limitations in the study that is this study was planned for a short period of time; the sample size was quite small. Furthermore, many other details, such as patient follow-up, were not fulfilled in order to determine the outcome of prescribed antimicrobials. The study did not consider any adverse effects of drug caused on by the use of any antimicrobial drugs.

## CONCLUSION

The present study analysed the prescription pattern of topical antimicrobial drugs in ophthalmic OPD patients at tertiary care teaching hospital.

Conjunctivitis was diagnosed in the majority of patients (40.37%). The topical antimicrobial agents (56.76%) were prescribed maximum followed by other drugs. Mostly topical antimicrobial drugs prescribed were moxifloxacin (eye drops) and chloramphenicol and polymyxin-b sulphate (ophthalmic ointment) in the patients of eye infections. The most common drug dosage form was an eye drop and eye ointment.

Topical antimicrobial medications were rarely prescribed by generic name, indicating the need for better prescribing practices through effective training and increased awareness among ophthalmologists. The use of brand names in prescriptions was a source of confusion. Less generic prescriptions may result in higher treatment costs because most medications are less expensive when taken under their generic names, which are less expensive than their brand names. As a result, it is essential to educate prescribers for the use of generic medicines in order to decrease cost of treatment.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee IEC NO: N-EC/2021/SC/01/17*

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