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PHARMACOEPIDEMIOLOGICAL EVALUATION OF DRUG PRESCRIBING PATTERNS IN OPHTHALMOLOGY OUTPATIENT AND INPATIENT DEPARTMENTS OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Pharmacoepidemiology integrates pharmacology and epidemiology to analyze the utilization and effects of medications in large populations. Rational drug use is essential for optimizing therapeutic outcomes, minimizing adverse drug reactions, and ensuring cost-effectiveness, especially in resource-limited settings. This study aims to assess prescribing patterns, drug availability, and cost-effectiveness in the ophthalmology outpatient (OPD) and inpatient (IPD) departments of a tertiary care hospital.

Materials and Methods: A prospective, observational cross-sectional study was conducted from September 2021 to August 2023 at Varun Arjun Medical College and Rohilkhand Hospital, Shahjahanpur, Uttar Pradesh. A total of 1562 prescriptions (1150 OPD and 412 IPD) were analyzed. Data were collected using a structured form to capture demographic details, drug-related variables, dosage regimen, and cost. Results were expressed as frequencies and percentages. Ethical clearance was obtained (VAMC/IEC/2021/XIV).

Results: The majority of patients belonged to the 46–60 years age group. Cataract and refractive errors were common in OPD, while cataract and glaucoma predominated in IPD. The average number of drugs per prescription was 2.81 (OPD) and 3.59 (IPD). Generic prescribing was low (26.04% in OPD, 35.33% in IPD), with a preference for brand names. Eye drops were the most commonly prescribed dosage form in OPD (81.93%), whereas injections were prevalent in IPD (90.47%). Polypharmacy was observed in 23.33% of OPD and 11.47% of IPD prescriptions. The entire cost burden fell on patients, with average costs of ₹87.40 (OPD) and ₹135.80 (IPD).

Conclusion: The study demonstrates rational prescribing in terms of dosage form and documentation, but highlights the need to increase generic prescribing, ensure complete recording of therapy duration, and enhance drug availability in hospital pharmacies. These findings underscore the importance of continuous prescription auditing and prescriber education to promote rational drug use in ophthalmology.

Key Words: Pharmacoepidemiology, Prescription Audit, Rational Drug Use, Ophthalmology, Generic Prescribing, Drug Utilization

INTRODUCTION

Pharmacoepidemiology is a crucial domain within pharmacological sciences, focusing on the application of epidemiological methods to study the utilization and effects of drugs in large populations, thereby supporting rational and evidence-based therapeutic practices [1]. Over the past decades, the emphasis has shifted from merely assessing the safety of drugs to a broader analysis encompassing effectiveness, accessibility, economic impact, and rationality of prescription practices [2,3].

Drug utilization research (DUR) forms the backbone of pharmacoepidemiology. It investigates the prescription, distribution, marketing, and consumption of pharmaceuticals, ultimately aiding in assessing the appropriateness of medication use and guiding healthcare policy reforms [4,5]. These studies are instrumental in identifying trends in prescribing habits, therapeutic outcomes, adverse drug reactions (ADRs), and cost-effectiveness of therapies, particularly in resource-constrained settings [6].

Globally, irrational drug use—including polypharmacy, over-prescription of antibiotics, and brand-name bias—remains a significant challenge to healthcare systems, leading to increased morbidity, antimicrobial resistance, and avoidable financial burdens [7,8]. According to the WHO, more than 50% of all medications are prescribed, dispensed, or sold inappropriately, and about half of all patients fail to take them correctly [9].

India, with its diverse population and pluralistic healthcare system, presents a unique landscape for pharmacoepidemiological analysis. Tertiary care hospitals, especially those serving both urban and semi-urban populations, often reflect varied drug prescription behaviors. Previous Indian studies have highlighted alarming trends in ophthalmic prescribing—such as the overuse of corticosteroids, underutilization of generics, and lack of adherence to treatment guidelines [10–12].

Moreover, while outpatient department (OPD)-based DUR studies are increasingly common, those encompassing inpatient department (IPD) settings, especially in ophthalmology, are sparse. This is concerning given the high burden of surgical and postoperative ophthalmic care requiring tailored pharmacotherapy, including antibiotics, anesthetics, and anti-inflammatory agents [13].

Another pressing issue in drug utilization is the skewed preference for brand-name drugs, which escalates the cost of therapy without corresponding improvements in outcomes [14]. Several Indian reports suggest that generic prescribing rates remain suboptimal, primarily due to physician inertia, pharmaceutical marketing practices, and patient demand [15].

This study was conceived in response to these gaps and concerns. The research aims to assess drug prescription patterns in both OPD and IPD of the ophthalmology department at a tertiary care teaching hospital in North India. By capturing detailed data on prescription frequency, drug forms, brand versus generic use, fixed-dose combinations, and economic impact, the study seeks to evaluate rationality in ophthalmic pharmacotherapy and identify actionable areas for intervention.

Additionally, this study serves as a prescription audit tool, providing feedback to prescribers and hospital administration for improving clinical practices, aligning with WHO's objectives for rational drug use and public health optimization [9].

The justification for conducting this research arises from the critical need to evaluate drug prescribing practices in both outpatient and inpatient ophthalmology departments, where data from inpatient settings remain markedly limited. Despite growing awareness around rational drug use, significant

gaps persist in prescription auditing, especially concerning brand versus generic use, frequency and dosage adherence, and cost-related considerations in tertiary care settings. Furthermore, the lack of comprehensive pharmacoepidemiological data from ophthalmic IPDs makes it difficult to formulate targeted interventions for improving drug use efficiency and affordability.

This study is timely and necessary as it offers insights into prescribing trends, adherence to rational use indicators, and the economic burden on patients—parameters crucial for institutional policy development and clinical education. By highlighting discrepancies and patterns, this research aims to inform better practices and encourage the development of localized prescribing guidelines that ensure patient safety and cost-effectiveness.

The purpose of this study is to perform a pharmacoepidemiological audit of prescriptions in the ophthalmology OPD and IPD of a tertiary care hospital to evaluate the pattern, rationality, availability, and cost-effectiveness of drug use.

MATERIALS AND METHODS

Study Design and Duration

This was a prospective, observational, cross-sectional study conducted over a period of two years, from September 2021 to August 2023, at the Department of Pharmacology in collaboration with the Department of Ophthalmology, Varun Arjun Medical College and Rohilkhand Hospital, Shahjahanpur, Uttar Pradesh.

Ethical Approval

Prior to the commencement of the study, approval was obtained from the Institutional Ethics Committee under the reference number VAMC/IEC/2021/XIV. Written informed consent was obtained from all participating patients. All data were handled with strict confidentiality in accordance with ethical standards.

Study Population and Sample Size

A total of 1562 prescriptions were analyzed during the study period, comprising 1150 outpatient department (OPD) prescriptions and 412 inpatient department (IPD) prescriptions. All patients attending the ophthalmology department during the study period and providing informed consent were included. Prescriptions with incomplete information or patients not consenting were excluded from the analysis.

Data Collection Procedure

Data were collected using a structured, pre-validated case record form developed to capture key study variables. OPD data were collected prospectively twice weekly, while IPD data were collected retrospectively from bed head tickets (BHTs) of admitted patients. Demographic details such as age, sex, and socioeconomic status were recorded using the modified Kuppuswamy's socioeconomic scale (Kumar et al., 2007). Relevant clinical information and details of prescribed medications were extracted and recorded systematically.

Drug and Prescription Variables Assessed

The variables assessed from each prescription included the name of the drug (whether prescribed by generic or brand name), dosage (expressed in mg/kg), dosage form (eye drops, ointment, tablet, capsule, syrup, or injection), frequency and route of administration (e.g., p.o., i.v., i.m., s.c.), and duration of therapy. The use of fixed-dose combinations (FDCs) was also noted. Additional data included the source of drugs (hospital pharmacy or outside purchase) and the cost per prescription. All medications were recorded using their generic names, with proprietary names included in parentheses where necessary. Frequently prescribed medications included moxifloxacin (eye drop, Alcon India), tropicamide + phenylephrine (Cipla Ltd.), tobramycin + dexamethasone (Allergan India

Pvt. Ltd.), nepafenac (Alcon), paracetamol (Abbott), acyclovir (GlaxoSmithKline), and natamycin (Sun Pharma).

Instruments and Materials Used

No specialized instruments or medical devices were used in the study. Data collection relied solely on patient case sheets, bed head tickets, and prescription slips. Standard hospital-issued forms and Microsoft Excel sheets were used for organizing and compiling the collected data.

Statistical Methods

Data were entered and analyzed using Microsoft Excel 2021. Only frequencies and percentages were calculated to describe the distribution of variables such as drug types, prescribing trends, dosage forms, and cost-related metrics. No inferential statistical tests were applied. The results were presented using descriptive tables and graphical formats to facilitate clear interpretation.

RESULTS

A total of 1562 prescriptions were analyzed, comprising 1150 from the outpatient department (OPD) and 412 from the inpatient department (IPD) of the ophthalmology department. The demographic distribution of patients in OPD and IPD is shown in [Table 1 & Figure 1]. The majority of patients belonged to the 46–60 years age group in both settings, with a slightly higher proportion of males compared to females.

Table 1: Demographic Profile of Patients Attending OPD and IPD

Patient Characteristics	OPD n (%)	IPD n (%)
Sex		
Male	651 (56.60%)	220 (53.39%)
Female	499 (43.39%)	192 (46.60%)
Age Group (years)		
0–5	82 (7.13%)	12 (2.91%)
6–15	60 (5.21%)	5 (0.43%)
16–30	146 (12.69%)	9 (2.18%)
31–45	183 (15.91%)	50 (12.13%)
46–60	431 (37.74%)	223(54.12%)
61–75	248 (21.56%)	113 (27.42%)

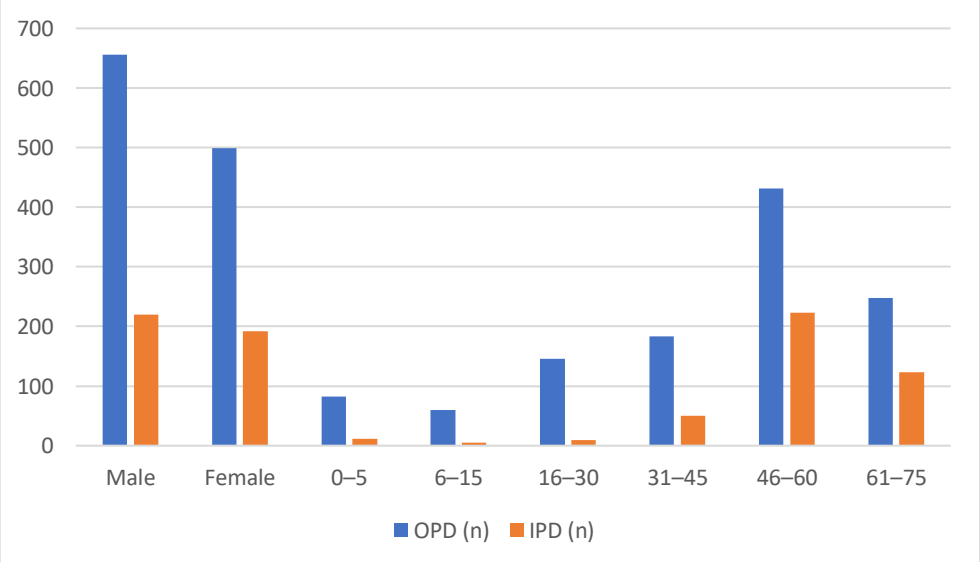

Figure 1: Demographic Profile of Patients Attending OPD and IPD

Lower middle-class patients represented 59.82% in OPD and 57.76% in IPD, followed by upper middle class at 18.33% and 23.37% respectively [Table 2 & Figure 2].

Table 2: Socioeconomic Classification of Study Population (Kuppuswamy Scale)

Socioeconomic Class	OPD n (%)	IPD n (%)
Upper Middle	210 (18.26%)	98 (23.78%)
Lower Middle	688 (59.82%)	238 (57.76%)
Upper Lower	178 (15.47%)	31 (7.52%)
Lower	74 (6.43%)	45 (10.92%)

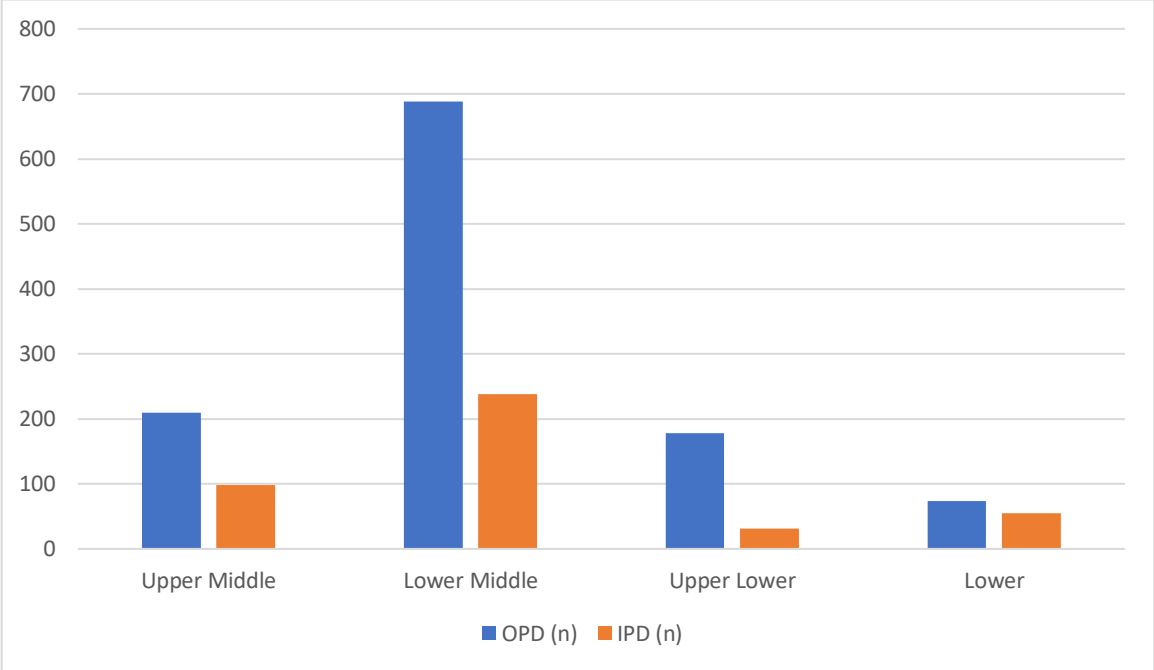

Figure 2: Socioeconomic Classification of Study Population (Kuppuswamy Scale)

In OPD, refractive errors (30.86%) and cataract (21.21%) were most common. In IPD, cataract (70.87%) and glaucoma (14.80%) were the leading diagnoses [Table 3 & Figure 3].

Table 3: Distribution of Common Ocular Conditions in OPD and IPD

Diagnosis	OPD n (%)	IPD n (%)
Refractive Errors	355 (30.86%)	–
Cataract	244 (21.21.21%)	292 (70.87%)
Conjunctivitis/Iridocyclitis	153 (13.30%)	9 (2.18%)
Corneal Ulcer	116(10.08%)	22 (5.33%)
Keratitis	104 (9.04%)	–
Glaucoma	100 (8.69%)	61 (14.80%)
Dacryocystitis	20 (1.73%)	7 (1.69%)
Foreign Body	8(0.69%)	–
Postherpetic Neuralgia	7 (0.60%)	–
Chalazion	6 (0.52%)	–
Others (Ptosis, Squint, etc.)	36 (3.1%)	21 (1.82%)

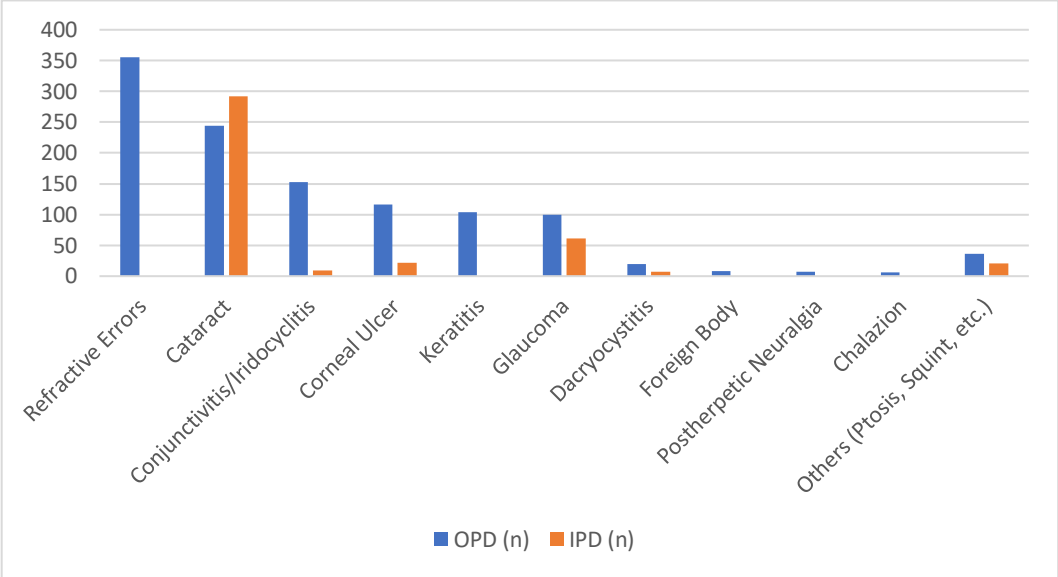

Figure 3: Distribution of Common Ocular Conditions in OPD and IPD

The average number of drugs per prescription was 2.81 in OPD and 3.59 in IPD. Dosage was recorded in over 98% of cases; therapy duration was noted in 89.41% (OPD) and 93.72% (IPD). Generic prescribing was 26.04% in OPD and 35.33% in IPD [Table 4 & Figure 4].

Table 4: Analysis of Prescriptions with Respect to Prescribing Indicators

Parameter	OPD n (%)	IPD n (%)
Total Number of Prescriptions	1150 (100%)	412 (100%)
Average Number of Drugs per Prescription	2.81	3.59
Dosage Recorded	1141 (99.25%)	416 (98.70%)
Frequency Recorded	1126 (98.00%)	412 (100.00%)
Duration of Therapy Recorded	1023 (89.41%)	383 (93.72%)
Generic Name Use	842/3233 (26.04%)	499/1483 (35.33%)
Brand Name Use	2391/3233 (73.95%)	959/1483 (64.66%)
Dispensed from Hospital Pharmacy	2691/3233 (83.24%)	1389/1483 (93.66%)
Fixed-Dose Combinations (FDCs)	64/3233 (1.98%)	15/1483 (1.00%)
Polypharmacy (>4 drugs)	280 (23.33%)	53 (11.47%)

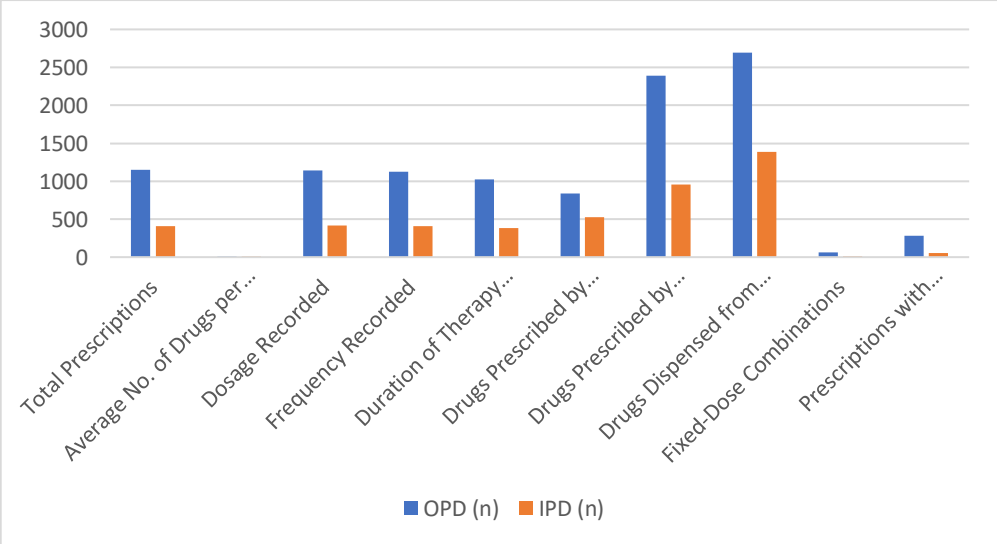

Figure 4: Analysis of Prescriptions with Respect to Prescribing Indicators

Eye drops were the most common dosage form in both OPD (81.93%) and IPD (86.17%). Injections were used in 91.70% of IPD prescriptions [Table 5 & Figure 5].

Table 5: Dosage Forms Prescribed

Dosage Form	OPD n (%)	IPD n (%)
Eye Drops	2649 (81.93%)	1278 (86.17%)
Ointments	570 (17.63%)	181 (12.20%)
Tablets	172 (5.33%)	122 (8.22%)
Capsules	97 (3.00%)	32 (2.16%)
Syrups	24 (0.74%)	77 (5.19%)
Injections	–	1360 (91.70%)

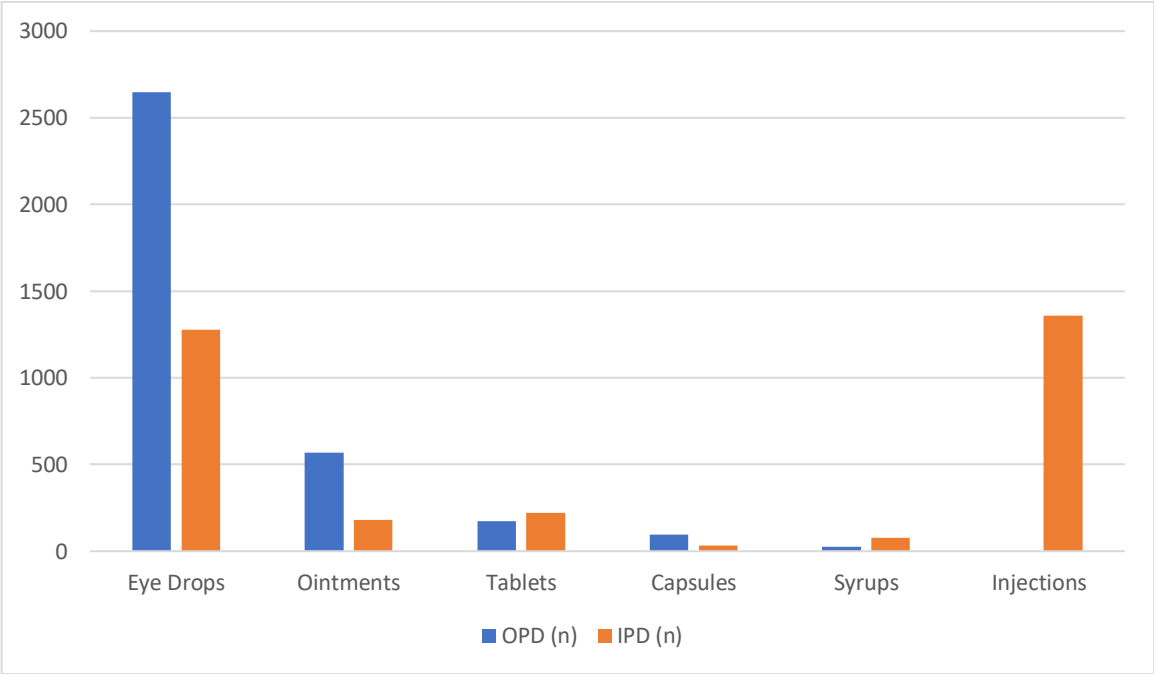

Figure 5: Dosage Forms Prescribed

In OPD, antibiotics (34.14%) and mydriatics (33.21%) dominated. In IPD, local anesthetics (95.67%) and anti-inflammatory drugs (55.36%) were most frequently prescribed [Table 6 & Figure 6].

Table 6: Therapeutic Class of Drugs Prescribed

Drug Class	OPD n (%)	IPD n (%)
Antibiotics	1104 (34.14%)	298 (20.09%)
Antibiotics + Steroids	708 (21.89%)	895 (60.35%)
Anti-inflammatory	517 (15.99%)	821 (55.36%)
Anti-inflammatory + ABX	487 (15.08%)	102 (6.87%)
Mydriatics	1074 (33.21%)	1104 (74.44%)
Antiglaucoma	199 (6.15%)	269 (18.13%)
Local Anesthetics	0 (0%)	1360 (95.67%)
Steroids	372 (11.50%)	435 (29.33%)
Antifungals	154 (4.75%)	67 (4.51%)
Antivirals	105 (3.24%)	51 (3.43%)
Lubricants	381 (11.78%)	57 (3.84%)
Antiallergics	786 (24.31%)	7 (0.47%)

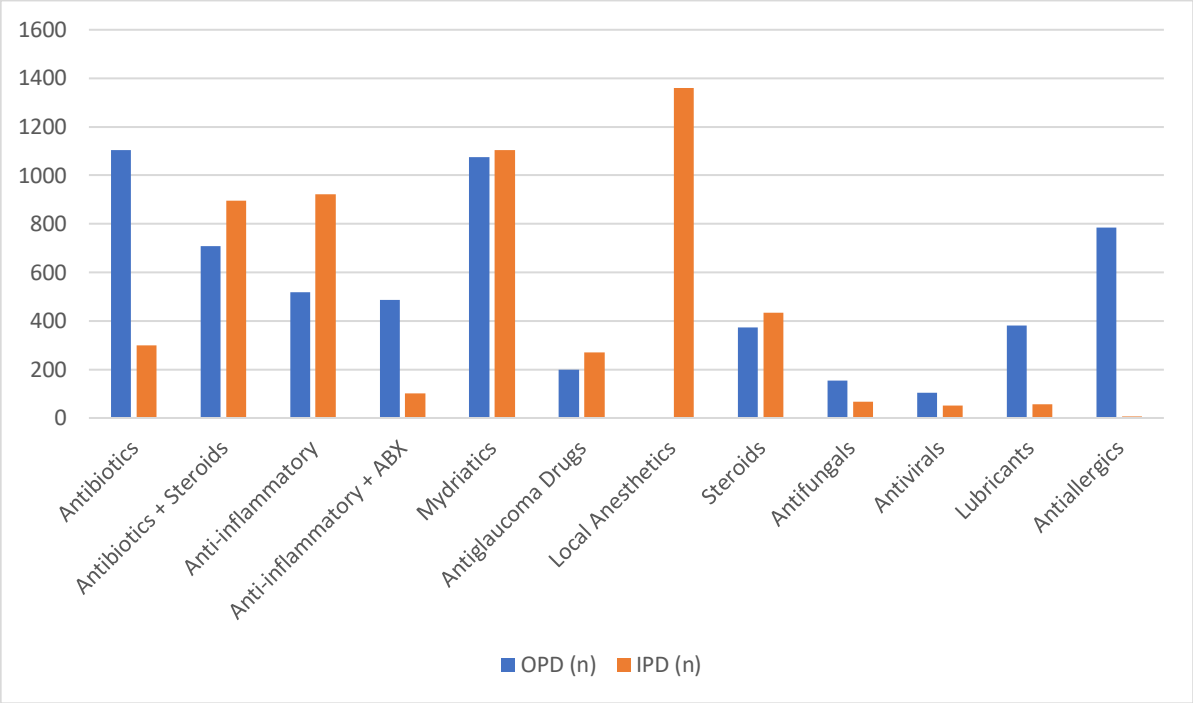

Figure 6: Therapeutic Class of Drugs Prescribed

The average prescription cost was INR 87.40 in OPD and INR 135.80 in IPD, with zero hospital pharmacy cost reported in both settings [Table 7 & Figure 7].

Table 7: Pharmaco-economic Profile of Prescriptions

Cost Parameter	OPD (INR)	IPD (INR)
Average Total Cost per Prescription	87.40	135.80
Average Outside Pharmacy Cost	87.40	135.80

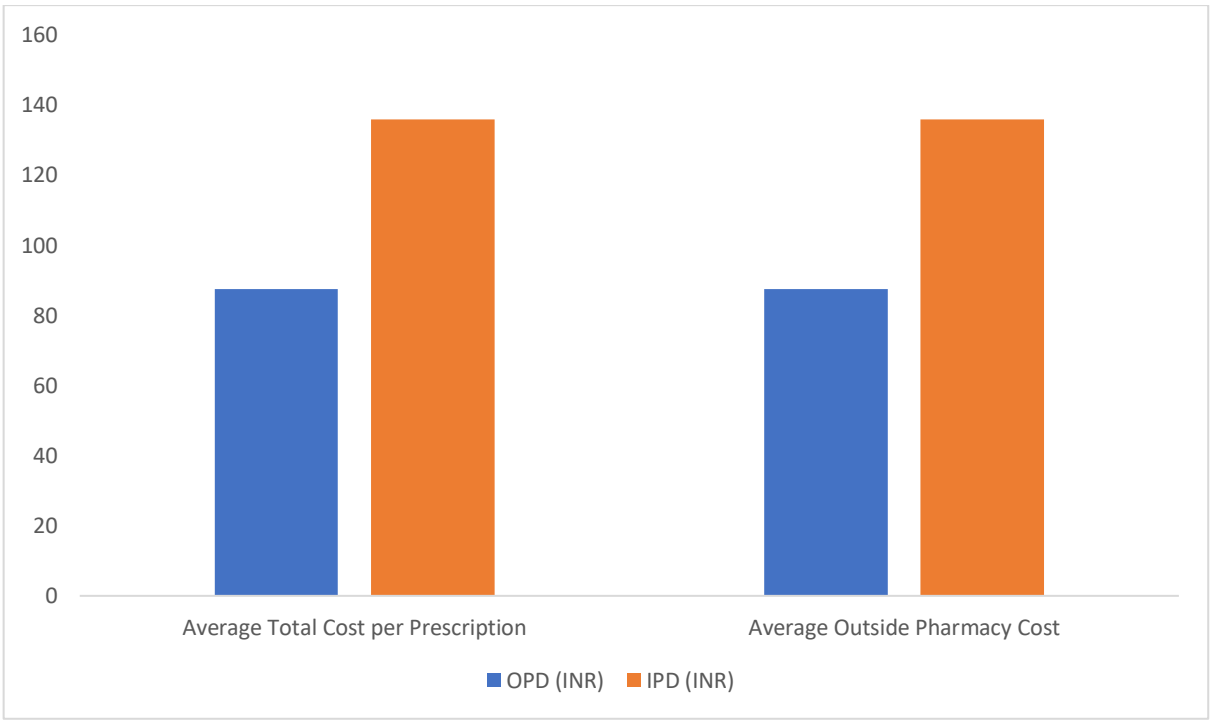

Figure 7: Pharmaco-economic Profile of Prescriptions

DISCUSSION

The current pharmacoepidemiological study provides an insight into the drug prescribing trends in the ophthalmology department of a tertiary care teaching hospital, examining both outpatient and inpatient practices. One of the key observations was the predominance of middle-aged and elderly patients, particularly those aged 46–60 years, which aligns with the known epidemiology of age-related ocular conditions such as cataract and glaucoma [16]. Similar age trends were observed in studies conducted by Biswas et al. and Singh et al., confirming that ocular morbidity escalates with age, particularly in resource-constrained rural or semi-urban populations [17,18].

The socioeconomic profile of the study population indicated a majority belonging to the lower middle class. This socioeconomic bias may reflect the regional demographic accessing government or low-cost healthcare facilities, and underscores the importance of rational and cost-effective prescribing in such settings. Previous studies in similar contexts have emphasized the link between economic status and treatment adherence, highlighting the need for affordable generic prescribing [19].

Notably, the pattern of drug prescribing in OPD revealed frequent use of antibiotics, mydriatics, and combination drugs (antibiotics with steroids), consistent with previous utilization studies in ophthalmology that emphasized their role in empirical therapy and preoperative preparation [20]. However, the high proportion of brand-name prescriptions, especially in OPD, suggests a persistent inclination among prescribers toward branded medications, possibly influenced by pharmaceutical marketing and lack of strict institutional policies. Earlier reports have also highlighted the underutilization of generics in Indian tertiary healthcare setups despite cost advantages and clinical equivalence [21,22].

The limited use of fixed-dose combinations (FDCs) in both OPD and IPD, although compliant with rational prescribing norms, might be attributable to the clinical conditions encountered, such as refractive errors and surgical cases, which typically require monotherapy or sequential drug regimens. In contrast, studies in dermatology and internal medicine have reported irrational use of FDCs, indicating better rationality in ophthalmology prescribing [23].

One of the strengths of the current study is the high level of completeness in prescriptions, with dosage and frequency mentioned in over above 98% of cases. This reflects adherence to basic prescription writing standards and is better than reports from other Indian institutions, where critical prescription components are often omitted [24,25]. However, the slightly lower documentation of treatment duration, especially in OPD, remains an area for improvement. Lack of this information can lead to prolonged or insufficient drug use, increasing the risk of resistance or therapeutic failure [26].

The analysis of dosage forms indicated a rational preference for topical agents such as eye drops and ointments in OPD, while systemic forms such as injections were prevalent in IPD, reflecting the perioperative and acute care needs of inpatients. This differentiation in prescribing based on setting is in accordance with standard ophthalmic practice and pharmacologic principles [27].

The economic data revealed that the entire cost of prescriptions was borne by patients, despite most drugs being dispensed from the hospital pharmacy. Although this reflects a hospital-supported dispensing model, there were still several medications that required external purchase, suggesting the need for a more robust drug procurement and stocking policy. High out-of-pocket expenses for ophthalmic medications have been linked to poor treatment adherence and follow-up in several Indian studies [28,29].

The average number of drugs per prescription slightly exceeded WHO's recommended threshold of two, suggesting a trend toward polypharmacy, especially in IPD where surgical and supportive therapies are often combined. While some degree of polypharmacy may be justified in postoperative and complex cases, efforts should be made to streamline therapy to avoid unnecessary combinations, drug interactions, and increased patient burden [30].

Study Limitations

The study was limited to a single tertiary care institution and focused exclusively on the ophthalmology department. Seasonal variations, physician preferences, and patient factors may have

influenced prescribing patterns. Furthermore, the cost analysis did not include indirect costs such as travel, wage loss, or follow-up visits, which are significant in low-income populations. The retrospective component in IPD may also have led to data omissions or inconsistencies.

CONCLUSION

In conclusion, the study highlights the predominance of rational prescribing practices in many areas, such as the use of appropriate dosage forms and documentation of essential prescription elements. However, there remains a need to enhance generic prescribing, improve documentation of treatment duration, and strengthen drug availability through institutional pharmacies. These findings support the original objective of the study to evaluate the prescribing patterns and cost-effectiveness of ophthalmic drug use in a tertiary care setting. Future studies should explore multi-center data, interventional models such as prescriber training, and longitudinal audits to promote rational use of medicines in ophthalmology.

Declaration of Interests:
The authors have no relevant financial or non-financial interests to disclose.

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