Assessment of Prescribing Pattern and Drug Utilization of Ophthalmic Medications in Dhaka city, Bangladesh

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Abstract
Background: Irrational prescription of drugs is a common occurrence especially in the developing countries. Regular monitoring of drug utilization pattern promotes the rational use of drugs. The objective of the present study was to assess the prescribing pattern and drug use in ophthalmology in Dhaka, Bangladesh and to evaluate its rationality with WHO core drug prescribing indicators and other parameters.
Methods: A retrospective study was conducted for two months on ophthalmology outpatient department in four hospitals of Dhaka city. Data was obtained from a total of 307 prescriptions and descriptive statistics was used in summarizing the results.
Results: The study revealed that ocular diseases might be age related and not sex dominated. Cataract (19.87%), refractive errors (12.7%) and conjunctivitis (9.77%) were the most common ocular disorders. Ophthalmic medications were prescribed mostly in the form of eye drops (58.74%). Antibacterial drugs were the most commonly prescribed class of drug (24.03%) of which Fluoroquinolone (Moxifloxacin) was more prominent. Most of the Fixed Dose Combination (FDC) drugs belonged to steroid-antibiotic combination agents. Prescription analysis showed that the average number of drugs per prescription was 2.68. Prescribing by generic name (0.97%) and from National Essential Drug List (12.38%) were very low. Dosage frequency and duration of therapy were recorded in more than 98% of the medications.
Conclusion: The prescribing pattern observed among the ophthalmologists is in accordance with the prevalent treatment approaches of ocular diseases. Prescription writing errors were low but polypharmacy was evidently high.
Key words: prescribing pattern, drug use, ophthalmology, WHO core drug prescribing indicators, Fixed Dose Combination, polypharmacy
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I.   Introduction

Eye care is one of the most sensitive practices of health care systems and irrational care of the eye could lead to patient harm ranging from temporary vision loss to blindness[1]. Globally, an estimate of 191 million people had moderate and severe vision impairment and 32.4 million people including 60% women were blind. The prevalence of moderate and severe vision impairment (MSVI) was the highest in South Asia (23.6%) compared to the second highest in Oceania (18.9%)[2]. Optimum management of ocular disease has impact on prevention of vision loss and reduction of burden of ocular health problems[3].

Irrational prescription of drugs is a common occurrence in clinical practice[4]. Inappropriate, irrational and cost-ineffective uses of pharmaceuticals are worldwide phenomena especially in the developing countries[5]. Prescription orders should always incorporate all necessary information and regular monitoring of the prescribing practice of medicines is required to assess its rationality[6]. The variations in the drug prescribing pattern, concerns over adverse drug reactions and escalation in the pricing of drugs have contributed to the increased significance of drug utilization studies[7]. Periodical auditing of drug utilization pattern is essential for promotion of rational use of drugs, for increasing the therapeutic efficacy and the cost-effectiveness and for decreasing the adverse effects[8]. World Health Organization (WHO) and International Network for the Rational Use of Drugs (INRUD) have developed standard drug use indicators[9].

A number of studies have been conducted in Bangladesh for the analysis of prescribing patterns and drug use; the number being very low in case of ophthalmic medications. The present study was undertaken to investigate the prescribing practices and drug utilization pattern of the ophthalmologists in Dhaka, Bangladesh. The principal aim of the study was to analyze rational use of drugs among prescribers and assess the quality of

drug therapy. The findings of the study will help to set the scheme for further investigations and thus minimize prolonged irrational use of drugs.

II. Material And Methods

Study design & setting: A retrospective study was conducted for the months of August & September, 2019 by analyzing the copies of prescriptions of patients in ophthalmology outpatient department of four hospitals within Dhaka city. Approval from Institutional Ethical Review Committee was taken before conducting the study.

Selection criteria: The patients were randomly selected and after assessment of their case sheets, a total of 307 patients were chosen for the study.

Inclusion criteria:
1. Patients of any age
2. Patients of either gender
3. Patients prescribed ophthalmic medications
4. Patients of ophthalmology outpatient department in hospitals

Exclusion criteria:
1. Patients with follow up cases
2. Patients who were not prescribed any drug
3. Patients who have undergone surgery
4. Patients of inpatient department

Data analysis: The prescriptions were audited and information of age, gender, prescribed brand, dosage form, dose, frequency, duration of therapy, indications for which prescribed were recorded in a data sheet. As almost all drugs were prescribed in brand names; the generic names and therapeutic class of the drugs were found using BDNF (Bangladesh National Formulary).Using the recorded information, demographic profile of patients, morbidity patterns, prescribed dosage forms, prominent therapeutic classes of drugs prescribed, most frequently prescribed generic medications and fixed dose combinations (FDC) drugs were assessed. The WHO core prescribing indicators -average number of drugs per prescription, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed and percentage of drugs prescribed from National Essential Drug List/Bangladesh National Formulary (BDNF) were analyzed. Extents of polypharmacy and prescription errors were calculated.

Statistical analysis: Descriptive statistics were performed. Data was entered and analyzed with Microsoft Excel 2016. Values were expressed as actual numbers, percentages and frequencies.

III. Results

Table no 1: Demographic profile of patients.

Factors	Types of groups	Number of patients	Percentage of patients (N=307)
Gender distribution	Male	151	49.19
	Female	153	49.84
Age distribution (in years)	Child (0-12)	35	11.4
	Adolescent (13-18)	19	6.19
	Adult (19-59)	170	55.37
	Senior Adult (60+)	67	21.82

Table 1 shows that out of 307 patients, 151 were male and 153 were female. Majority of the patients belonged to the age group 19-59 years.

The prescriptions mentioned the ocular problems in terms of chief complaints or diagnosis. Table 2 shows the most common ocular diseases and chief complaints in the study population.

Table no 2: Five most common ocular diseases and chief complaints.

Most common ocular problems		Percentage of patients (N=307)*
Ocular diseases	Cataract	19.87
	Refractive Error	12.7
	Conjunctivitis	9.77
	Keratitis	4.56
	Viral infection of eye	4.56
Chief complaints	Itching	8.14
	Watering	7.17
	Discharge	5.54
	Headache/Migraine	5.54
	Redness	5.54

* The total percentage exceeds 100% as some patients had multiple disease conditions
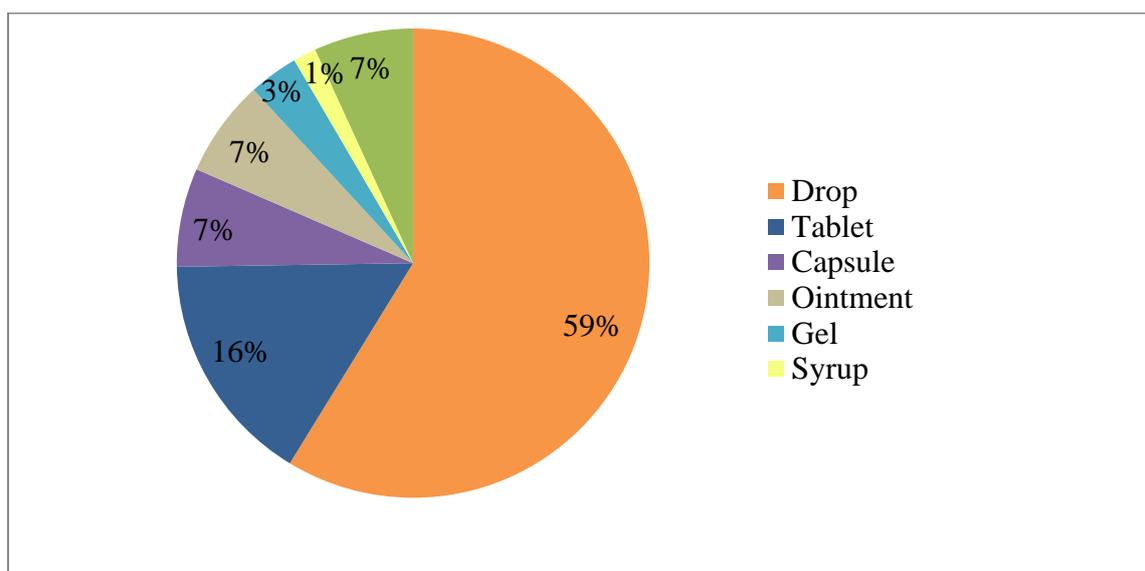

Figure 1: Percentage of different dosage forms.

A total of 824 drugs were prescribed in the 307 prescriptions analyzed. 484 eye drops were prescribed comprising 58.74% of the total as depicted in Figure 1. This was followed by 132 tablets (16.02%), 56 capsules (6.8%), 55 ointments (6.67%), 28 gels (3.4%) and 13 syrups (1.58%).

Out of 824 drugs prescribed, 803 were ophthalmic drugs and the rest of them played role as a supportive therapy. Classifying the ophthalmic medications based on therapeutic classes, as depicted in Figure 2, showed that antibacterial drugs (24.03%) were the most commonly prescribed ones. Drug for dry eyes (18.68%) was the second most prominent class of drugs prescribed.

Carboxymethylcellulose Sodium (11.71%), a drug for dry eyes, was the most frequently prescribed drug. Moxifloxacin (Fluoroquinolone) was the most commonly prescribed antibiotic and the second most commonly prescribed drug in this study [Table 3].

Polyethylene Glycol 400+Propylene Glycol (3.49%) was the most frequently prescribed Fixed Dose Combination (FDC) drug. All other combinations in the top five list belonged to the class of steroid-antibiotic combined agents of which a combination of Loteprednol Etabonate and Tobramycin (2.12%) shows the highest percentage [Table 4].
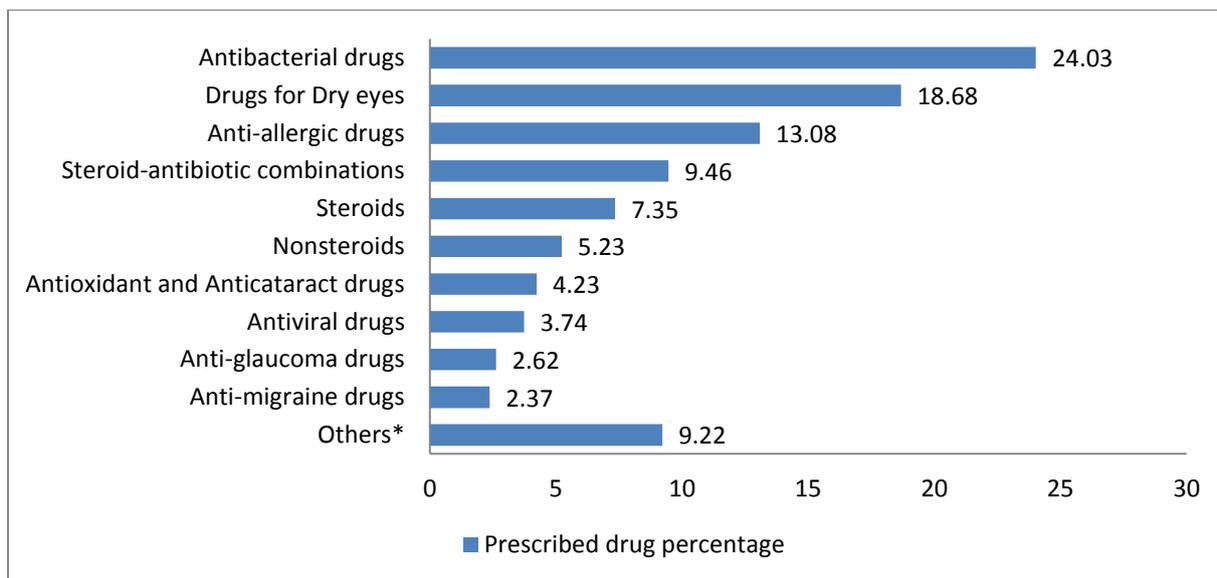
*Others: analgesics, drugs for lens opacification, mydriatics and cycloplegics, vitamin preparations, NSAIDs, antifungal drugs, drugs affecting exocrine secretion, diagnostic preparation, immunosuppressant and drugs for corneal edema

Figure 2: Therapeutic classes of ophthalmic drugs prescribed (N=803).

Table no 3: Twelve most frequently prescribed ophthalmic medications.

Sl. No.	Most frequently prescribed medications	Therapeutic class	Percentage (N=803)
1.	Carboxymethylcellulose Sodium	Drug for dry eyes	11.71
2.	Moxifloxacin	Antibacterial drug	11.21
3.	Fexofenadine Hydrochloride	Anti-allergic drug	5.73
4.	Vitamin C+VitaminE+Zn+Cu+Lutein	Antioxidant &anticataract drug	4.23
5.	Polyethylene Glycol 400+Propylene Glycol	Drug for dry eyes	3.49
6.	Olopatadine	Anti-allergic drug	3.11
7.	Nepafenac	Nonsteroid	2.99
8.	Tobramycin	Antibacterial drug	2.61
9.	Levofloxacin	Antibacterial drug	2.49
10.	Bromfenac Sodium	Nonsteroid	2.24
11.	Ganciclovir	Antiviral drug	2.24
12.	Loteprednol Etabonate+Tobramycin	Steroid-antibiotic combination	2.12

Table no 4: Five most frequently prescribed Fixed Dose Combinations (FDCs).

Sl. No.	Fixed Dose Combinations	Therapeutic Class	Percentage (N=803)
1	Polyethylene Glycol 400 0.4% +Propylene Glycol 0.3%	Drug for dry eyes	3.49
2	Loteprednol Etabonate 0.5%+Tobramycin 0.3%	Steroid-antibiotic combination	2.12
3	Moxifloxacin 0.5%+Dexamethasone Phosphate 0.1%	Steroid-antibiotic combination	1.87
4	Chloramphenicol 0.5%+Dexamethasone 0.1%	Steroid-antibiotic combination	1.62
5	Dexamethasone 0.1%+Tobramycin 0.3%	Steroid-antibiotic combination	1.62

Number of drugs prescribed per prescription was counted to get an idea of polypharmacy. In this study, the number of drugs per prescription varied from one to six and 21 patients (6.84%) were prescribed with five or more medications [Table 5].

Table no 5: Number of drugs prescribed per prescription.

Prescription containing number of drugs	Number of prescriptions (%)
Zero	0
One	45 (14.66%)
Two	106 (34.53%)
Three	88 (28.66%)
Four	47 (15.31%)
Five	11 (3.58%)
Six	10 (3.26%)
	Total=307 (100%)

The WHO core prescribing indicators are used in drug utilization studies for measuring the rationality of drug use and there are standard values for them (WHO, 1993). As 824 drugs were prescribed in 307 prescriptions, the average number of drugs per prescription was 2.68 [Table 6].

Table no 6: Drug utilization based on WHO/INRUD indicators.

	Indicators assessed	WHO core prescription indicators	
		Study value	Standard value
1.	Average number of drugs per prescription	2.68	1.6-1.8
2.	Percentage of drugs prescribed by generic name	0.97%	100%
3.	Percentage of encounters with an antibiotic prescribed	42.35%	20-26.8%
4.	Percentage of encounters with an injection prescribed	0%	13.4-24.1%
5.	Percentage of drugs prescribed from National Essential Drug List	12.38%	100%

Prescriptions were analyzed for prescription errors based on omission of information. The study shows that the three important parameters-dosage form, frequency and duration of therapy were mentioned in 93.33%, 99.76% and 98.42% of the total drugs prescribed [Table 7].

Table no 7: Analysis of prescriptions with respect to different parameters.

Parameters	Recorded	Not recorded
Dosage form (N=824)**	93.20%	6.80%
Frequency of administration (N=824)**	99.76%	0.24%
Duration of therapy (N=824)**	98.42%	1.58%
Dose (for oral preparations only, N=203)***	99.51%	0.49%
Wrong spelling of brand name (N=824)**	99.02%	0.98%
Name/gender (N=307)*	99.02%	0.98%
Age (N=307)*	94.79%	5.21%
Date (N=307)*	99.02%	0.98%
Diagnosis or complaint (N=307)*	78.83%	21.17%
Illegible handwriting (N=307)*	98.70%	1.30%

*N=307=Total number of prescriptions studied
**N=824=Total number of medications prescribed in the 307 prescriptions
***N=203=Oral preparations only; others had dose mentioned or had only one strength and so excluded

IV.   Discussion

As the ratio of male to female patients was 1:1, the study showed no sex preponderance among the patients. Older people were seen to suffer more from eye related problems than the young. Eye diseases are not sex linked but could be age related. This has been seen in similar studies in India and Ethiopia[6,10].

The main causes of visual impairment in Bangladesh are cataract, refractive error, macular degeneration, uncorrected aphakia, central corneal opacity, posterior segment disease, glaucoma etc[11]. Thus, these tend to be the most prevailing disease conditions. The first two conditions found in the study, cataract (19.87%) and refractive error (12.7%), correspond to the claimed major causes of visual impairment in the country.

Eye drops were found to be most commonly prescribed. The results were similar to another study in which the maximum number of drugs prescribed was in the form of eye drops, followed by tablets[12]. Topical preparations (drops, ointments & gels) covered about 69% of the total and showed they were preferred over oral routes (tablets, capsules, syrups) for treatment. It might be because of their local action, less systemic absorption and greater patient convenience[10].

This study shows that antibiotics were the most prescribed therapeutic class of drugs. They are used for the purpose of treating eye infections[6,13]. Similar studies previously done in ophthalmology also showed that Fluoroquinolone was the most common group of antibiotics prescribed[14,15]. As for the most frequently prescribed drug, Carboxymethylcellulose Sodium tops the list. It is indicated mainly in cataract, which was found to be the most prevailing disease condition among the study group and so the use of the drug is justified in this study.

Most Fixed Dose Combination (FDC) drugs were steroid-antibiotic combination agents. Due to co-existence of infections and inflammations in many cases, antibiotic and steroid combinations are often used in combination. There are conditions when either antibiotic or steroid is indicated and using of the other class of drug is contraindicated. Antibiotic therapy when not indicated may develop resistance to the drug and may not respond in times of necessity. Unjustified use of steroids can aggravate the infection particularly viral infections and prolonged use may lead to steroid induced cataract and glaucoma. A combination of steroid and antibiotic eye drops should therefore be used only in specific conditions where both are indicated[16].

Rational drug prescribing can be defined as the use of the minimum number of drugs to obtain the maximum effect within the shortest time and at a reasonable cost[17]. Polypharmacy is a form of irrational drug prescribing. It is considered as the prescription having five or more medications daily[18]. In this study, 21 patients (6.84%) were prescribed with five or more medications.

Average number of drugs per prescription, which should be 1.6-1.8, is an important index to measure the extent of polypharmacy[9]. The number of drugs prescribed per prescription should be limited to two and prescribing more than two drugs has to be justified[19]. The average number of drugs per prescription in this study (2.68) is higher than that recommended by WHO. It is also higher than results of studies conducted in Ethiopia, Saudi Arabia and India[6,20,21]. Higher number of drugs per prescription increases the risks of drug-drug interactions, total hospital cost and prescribing errors. The recommendation of WHO is not applicable to inpatient and those who have undergone surgery. Polypharmacy is justified in such cases because the average length of stay of these patients will be higher which will lead to more medications prescribed and administered.

Only 0.97% of the drugs were prescribed as generic names, which is very low compared to other hospital based studies in ophthalmology[6,12,21]. As most of the drugs (99.03%) were prescribed as brand names, this study indicates the biasness of the prescribers towards brands and also the influence of pharmaceutical companies. All prescriptions should be prescribed by their generic names. Apart from optimizing the treatment cost, prescribing drugs with generic names avoids prescription writing errors and eliminates confusion of dispensing sound alike and spell similar branded drugs[15].

The average percentage of antibiotics per prescription should be in the range of 20 to 26.8%[9]. In this study, the percentage of antibiotics prescribed (42.35%) exceeded the recommended value. Higher than average number of antibiotic consumption might be due to higher prevalence of infective conditions caused by dry environment, poor education, less awareness and poor sanitation. Irrational use or overprescribing of antibiotics may culminate into increased adverse events and increased risks of antimicrobial resistance[22].

Percentage of encounters with an injection prescribed was 0%. Lower use of injections can minimize local toxicity and overall treatment cost[23]. Only 12.38% of the drugs were prescribed from National Essential Drug List[24]. Lack of awareness among the ophthalmologists in Bangladesh might have resulted into this low percentage.

Majority of errors committed while prescribing are due to omission of information like dosage form, strength, or regimen, and also illegible prescriptions[25]. Trivial errors consisting of spelling errors or omissions such as date, age and/or gender of the patient etc. do not hamper the execution of prescriptions[26]. The frequency, dosage and duration of drug therapy are three important parameters, if not clearly recorded, can result in indiscriminate and injudicious use of drugs[21]. Most of the prescriptions under study had complete information and minor errors were evident due to omission of information. Dosage frequency and duration of therapy were mentioned adequately except in few cases.

V.   Conclusion

The current study portrays that the prescribing pattern observed among the ophthalmologists is in accordance with the prevalent treatment patterns of ocular diseases. Analysis of prescriptions showed that most of the ophthalmologists bear good knowledge of proper prescription writing. Although the findings represent satisfactory results, there are areas which need to be highlighted for further improvement. Minor prescription errors were found due to omission of information. Assessment of the drug use with the help of WHO core drug prescribing indicators showed that polypharmacy was prevalent and the average number of drugs per prescription was high. Moreover, almost all drugs were prescribed with their brand names and only few drugs were prescribed from National Essential Drug List. Drug prescribing habits of ophthalmologists are influenced by local pharmaceutical companies. Antibiotics must be carefully prescribed. It is recommended that the prescribers should strictly follow the WHO recommendations for prescribing of ophthalmic medications in order to promote rational use of drugs. While prescribing, an ophthalmologist should focus on proper use of drugs, prescribing drugs by generic names and cost-effectiveness of the treatment. Proper prescribing guidelines and educational initiatives may facilitate rational and appropriate drug use. Although the sample size of the study is small, similar well-designed observational studies conducted at regular intervals with larger sample size will help to improve rational prescribing and find out early signals of irrational drug use.

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