An Exploratory Study on the Drug Utilization Pattern in Glaucoma Patients at A Tertiary Care Hospital

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ABSTRACT

Glaucoma is a chronic, progressive optic neuropathy caused by group of ocular conditions which lead to damage of optic nerve with loss of visual function. The objective of the study is to assess the average number of drugs per prescription, formulations being prescribed, various categories of drugs being prescribed and the category most often used in glaucoma patients in ophthalmology. This is a retrospective hospital based study carried out in the department of ophthalmology at A.J institute of medical sciences, Mangalore. The study period was from July 2012 to July 2013. Total number of prescriptions analyzed were 344 , in which total of 1,064 drugs were prescribed. Analysis of the prescriptions showed that average number of drugs per prescription was 3.09. The maximum number of drugs prescribed were in the form of eye drops (76.56%), followed by ointments (12.06%), tablet (4.2%), capsules (3.94%), syrup (2.16%) and injection (1.08%). The dosage form was indicated for 94%, frequency of drug administration for 96% drugs and duration of treatment for only 78% of the drugs prescribed. Around 48.44% of diagnosis accounted for primary open angle glaucoma. Rest 32.96% and 18.6% acconting for angle closure glaucoma and absolute glaucoma respectively. The number of antibiotics prescribed was 600 (56.43%), out of these 413 (68.79%) antibiotics were prescribed in the form of drops, 174 (29.06%) as ointment and 13 (2.15%) orally. Number of encounters with anti-inflammatory and antiallergic drugs was 118 (11.12%), mydriatics and cycloplegics 105 (9.84%), miotics 28 (2.6%), lubricant and miscellaneous eye drops 209 (19.63%) and multivitamins 4 (0.38%). Prescription writing errors were at its minimum thereby avoiding irrational prescriptions. Duration of treatment and prescribing by generic name were very low.

INTRODUCTION

Glaucoma is a chronic, progressive optic neuropathy caused by group of ocular conditions which lead to damage of optic nerve with loss of visual function. Glaucoma describes a group of diseases that kill retinal ganglion cell. High IOP is the strongest known risk factor for glaucoma but it is neither necessary nor sufficient to induce the neuropathy. IOP is not helpful diagnostically until it reaches approximately 40 mm Hg at which level the likelihood of damage is significant. Visual fields are also not helpful in the early stages of diagnosis because a considerable number of neurons must be lost before VF changes can be detected.Optic nerve damage in the early stages is difficult or impossible to recognize.Drug utilization has been defined as the marketing, distribution, prescription and use of drugs in a society with special emphasis on the resultant medical, social and economic consequences (WHO,1977). Third world countries spend 30–40% of their total health budget on drugs, some of which are useless and expensive and doubles their expenditure on drugs every 4 years while GNP (Gross National Product) doubles every 16 years (Melrose,1983). Drug utilization pattern in glaucoma patients needs to be evaluated from time to time so as to increase therapeutic efficacy and decrease adverse effects. Hence periodical auditing of drug utilization pattern is vital for promotion of rational use of drugs, for increasing the therapeutic efficacy and the cost effectiveness, for decreasing the adverse effects and to provide feedback to the prescribers (Krishnaswamy *et al.,* 1985) . It is important to realize that inappropriate use of drugs represent a potential hazard to the patients and an unnecessary expense (Hawkey *et al.,* 1990). One-third of patients with glaucoma do not have elevated IOP. Most of the ocular findings that occur in people with glaucoma also occur in people without glaucoma. There is a dose-response relationship between intraocular pressure and the risk of damage to the visual field.

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The drug utilization 90% (DU 90%) index was introduced as a simple, inexpensive and flexible method for assessing the quality of the drug prescriptions. It identifies the drugs accounting for 90% of the volume of the prescribed drugs after ranking the drug used by volume of defined daily dose (DDD) (Saepudin, 2008). The remaining 10% may contain specific drugs which are used for rare conditions in patients with a history of drug intolerance or adverse effects (Wettermark *et al.,* 2003). Use of medicines constitutes an important part of many medical treatments and disease prevention interventions. Some studies on drug utilization in Spain have observed that immigrants consume fewer medicines and have much lower expenditures on pharmaceuticals compared to the autochthonous population (Rue *et al.,* 2008; Carrasco *et al.,* 2007). Another aspect modulating drug utilization patterns of migrants is the possible lack of trust in the proposed treatment and as a consequence, poor compliance. The present study was undertaken to assess the patterns of prescription and drug utilization in glaucoma patients by measuring WHO delineated drug use indicators in the Department of Ophthalmology. Therefore the principal aim of drug utilization research is to facilitate the rational use of drugs in population and generate hypotheses that set the agenda for further investigations and thus avoid prolonged irrational use of drugs. The irrational use of drugs is a common occurrence throughout the world (Maini *et al.,* 2002; Gangwar *et al.,* 2011). Average number of drugs per prescription is an important index of the scope for review and educational intervention in prescribing practices. It is preferable to keep the number of drugs per prescription as low as possible since higher figures lead to increased risk of drug interactions, errors of prescribing increased hospital cost (Nies, 1990; Pradhan *et al.,* 1990; Atanasova I, Terziivanov, 1995). Other hospital based studies in India reported figures of 3–5 drugs per prescription. Isabella Topno et al study was designed with the aim to investigate the antibiotics utilization pattern in a tertiary care hospital where common prescription writing errors were minimum and there was no evidence of polypharmacy (Isabella *et al.,* 2012). Keeping these facts in consideration, the present study was planned with the aim of prescription analysis of the drugs to define the pattern of use, their availability in the hospital by analyzing each prescription of glaucoma patients in ophthalmic department of a tertiary care hospital at A J Institute of Medical Sciences, Mangalore.

MATERIALS AND METHODS

This retrospective hospital based study was conducted for 1 year duration i.e. from July 2012 to July 2013 at A J Institute of Medical Sciences Mangalore.

Method of Collection of Data

Prescriptions of patients treated for glaucoma during the course of the study were audited retrospectively using a specially designed form to record the required information from the case sheets of each patient. All the drugs prescribed for glaucoma were recorded including its dosage form, route of administration, frequency of administration, indications for which prescribed and duration of therapy. These forms were then used to analyze the average number of drugs per prescription, number of encounters with antibiotics, anti-inflammatory drugs and other agents, dosage form of drugs, the frequency of drug administration and the duration of therapy (recorded or not) and whether the drugs were prescribed in generic or proprietary names.

- The source data was collected between the period July 2012-July 2013. Both males and   females those diagnosed with glaucoma and treated in the Department of Ophthalmology at A. J Institute of Medical Sciences, were included in the study.
- Sample size: The number of case sheets that were assessed from July 2012 to July 2013.
- The following data were collected: Patient particulars, history, diagnosis, drugs- the dosage, frequency and duration of treatment, co-morbid condition, generic or brand prescription were obtained using the study proforma.

Selection Criteria
A. Inclusion Criteria
- Patients of any age group
- Patients of either gender
- Patients treated in ophthalmology department for glaucoma

B. Exclusion Criteria
- Patients who were diagnosed with other ophthalmological condition

Statistical Analysis

Analysis of the prescriptions was done from the case record form. Data collected were analyzed by frequency, percentage and Chi Square test using SPSSv16 software.

RESULTS

After screening prescriptions of patients it was found that out of the total 344 prescriptions, 180 were males and 164 were females. In the 344 analyzed prescriptions, 1,064 drugs were prescribed. Analysis of the prescriptions showed that average number of drugs per prescription was 3.09 (Table 1). The common eye conditions encountered in the ophthalmology were primary open angle glaucoma which accounted for around 48.44% of diagnosis. Rest 32.96% and 18.6% acconting for angle closure glaucoma and absolute glaucoma respectively. Regarding the dosage forms (Figure 1), it was found that the maximum number of drugs prescribed were in the form of eye drops (76.56%), followed by ointments (12.06%), tablet (4.2%), capsules (3.94%), syrup (2.16%) and injection (1.08%) (Table 2). The number of antibiotics prescribed was 600 (56.43%), out of these 413 (68.79%) antibiotics were prescribed in the form of drops, 174 (29.06%) as ointment and 13 (2.15%) orally. Number of

encounters with anti-inflammatory and antiallergic drugs was 118 (11.12%), mydriatics and cycloplegics 105 (9.84%), miotics 28 (2.6%), lubricant and miscellaneous eye drops 209 (19.63%) and multivitamins 4 (0.38%). (Figure 2). The dosage form was indicated for 94%, frequency of drug administration for 96% drugs and duration of treatment for only 78% of the drugs prescribed. Similarly drugs prescribed by their generic names were 32.44% and about 67.56% of the drugs were prescribed by their brand names (Table 3).

Table. 1: Number of drugs prescribed per prescription.

Number of drugs per prescription	Number of prescriptions n(%)
One	19(5.45)
Two	104(30.34)
Three	166(48.32)
Four	39(11.23)
Five	14(4.2)
Six	2 (0.46)
Total	344(100)

Table. 2: Major therapeutic agents and dosage forms of antimicrobials.

Dosage form	Major therapeutic agent
Drops 413 (68.79%)	Ciprofloxacin (Adiflox)
	Gatifloxacin (G-flotas D)
	Flurbiprofen (occuflur)
	Timolol (Iotim)
	Chloramphenicol
	Homatropine hydrobromide (Homide)
	Moxifloxacin (Moxiblu)
	Pilocarpine (Pilocar 2%)
	Sodium cromoglycate (Andre)
	Carboxyme cellulose Na (Ecotears)
	Lubricant(Hypromellose Nacl) (Lacrigel)
	Sodium chloride (soline 5%)
Ointment 174 (29.06%)	Ciprofloxacin
	Gatifloxacin
	Atropine
	Acyclovir
	Steroid (Cortisone)
Oral 13 (2.15%)	Ciprofloxacin
	Cefixime
	Ranitidine
	Dexamethasone

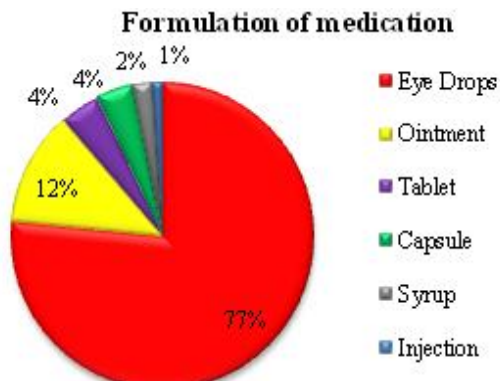**Fig. 1:**

Table. 3: Analysis of prescriptions of patients with respect to different parameters.

Sl.no	Drug use indicators	Results
1.	Total number of prescriptions	344
2.	Average number of drugs per prescription	3.09
3.	Percentage of dosage forms recorded	94%
4.	Percentage of frequency of therapy recorded	96%
5.	Percentage of duration of therapy recorded	78%
6.	Percentage of drugs prescribed by generic name	32.44%
7.	Percentage of drugs prescribed by brand name	67.56%

Fig. 2:

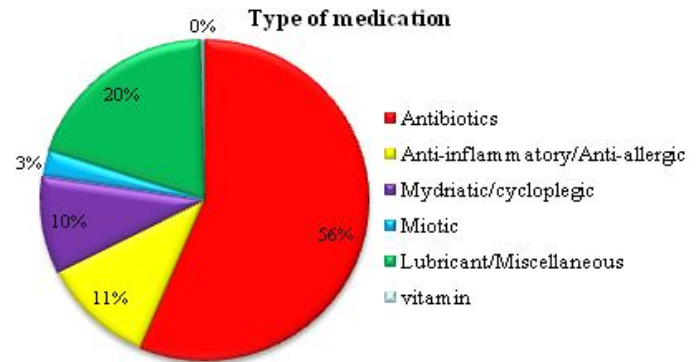## DISCUSSION

After screening of 344 glaucoma patients prescriptions, it was found that there was no sex preponderance (M : F = 1.2:1) among the patients and the maximum number of patients belong to age group of 46-60 years. These findings showed that glaucoma is usually not sex linked but may be age related. Drug prescriptions form a very important point of contact between the health care provider and the user (Nehru *et al.,* 2005) It provides an insight into the nature of health care delivery system and is a reflection of physicians attitude towards the disease and the role of drug in its treatment (Shankar *et al.,* 2010). Average number of drugs per prescription is an important index of prescription audit. Historically the pharmaceutical and medical professions have devoted considerable time and efforts to the development and rational utilization of safe and effective drugs for the treatment and prevention of illness. There has been development of many new therapeutic agents which have made it possible to cure or provide the symptomatic control of many clinical disorders. However in many circumstances drugs are not used rationally for optimal benefits and safety (Hussar, 1995). Therefore drug utilization studies in glaucoma patients can be a powerful tool that can benefit patient and public health but only if used appropriately by providing the insights into various aspects of drug prescribing and drug uses. WHO organizes many drug utilization researches with the goal of rational prescription by various methods of auditing. The study was also a part of prescription audit. Around 48.44% of diagnosis accounted for primary open angle glaucoma. Rest 32.96% and 18.6% acconting for angle closure glaucoma and absolute glaucoma respectively. Patients with glaucoma were treated by the various drugs in different dosage forms and ongoing medical treatment was modified according to clinical response and the most common drugs prescribed were antibiotics, mydriatics, antibiotics+steroids and anti-inflammatory. The high use of antibiotics reflect the condition of poor sanitation, nutrition, prevalence of various infections, post operative infection and certain acute infective conditions which needs conservative management. Similary anti-inflammatory drugs were used for

relief of pain and swelling and mydriatics were used for fundus examination and surgery and for conservative management of glaucoma. It has been recommended that the limit of number of drugs prescribed per prescription should be two and that justification for prescribing more than two drugs would be required because of the increased risk of drug interactions (Nies, 1990). In this study, the average number of drugs per prescription was 3.09 for glaucoma patients which is more than the current recommendation. Other hospital based studies in India reported 3-5 drugs per prescription almost in the same range as our study (Maini *et al.,* 2002; Kutty *et al.,* 2002; Sharma *et al.,* 1990). Therefore it is advisable to keep the number of drugs per prescription as low as possible since higher figures lead to increased risk of drug interactions, increased hospital cost and errors of prescribing (Nies, 1990; Pradhan *et al.,* 1990; Terziivanov, 1995). The frequency, dosage and duration of drug therapy are the three important parameters, if not clearly recorded, can result in indiscriminate and injudicious use of drugs. The present study showed that the dosage and frequency were recorded in more than 90% of prescriptions but the duration of therapy was recorded only in 78% of prescriptions. When the various dosage forms were compared it was found that eye drops were commonly prescribed followed by ointments, tablets, capsules, syrups and injections. The results were similar to other studies in which the maximum number of drugs prescribed were in the form of eye drops, followed by tablets (Biswas *et al.,* 2001). This finding supports the use of topical preparation for treating glaucoma as they have site specific action, less systemic absorption resulting in fewer side effects and convenient for patient use. Percentage of drugs prescribed in glaucoma by their generic names in our study were 32.44% which was almost similar to one study (23%) as well as contrast (53.6%) to some other studies (Ghosh *et al.,* 2003; Joshi *et al.,* 1997). Few earlier studies have also reported to only 29.3% and 19% of drugs prescribed by generic name (Rehana *et al.,* 1998; Minocha *et al.,* 2000). It suggests the popularity of brand names amongst the medical practitioners of the institute and the influence of pharmaceutical companies. Prescriptions by brand names could possibly result in prescribing errors because the brand names of many pharmacologically different drugs sound alike and spell similar. In general, generic drugs are less expensive as compared to the brands that contain the same active ingredient. So the prescriptions of generic drugs should be emphasized to facilitate cheaper and better treatment for the patient. Rational drug prescribing is defined as the use of the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost (Nehru *et al.,* 2005). Since, WHO has recommended that average number of drug per prescription should be two, result of our study reflects polypharmacy (Gross, 1981). The recommendation by WHO is not applicable to patients who have undergone surgery, since majority of these patients the average length of stay would be higher which means more medication prescribed and administered. In such cases polypharmacy can be justifiable. In case of glaucoma as many of the patients will be taken up for surgery, as surgery is the ultimate

treatment to eradicate the cause, polypharmacy is justifiable. The practice of polypharmacy should be restricted to conditions, as many a times they are unnecessary, increasing the morbidity by pharmacokinetic and pharmacodynamic drug interactions and increasing the cost of treatment. The common prescription writing errors were minimum and there was no evidence of polypharmacy except in patients who underwent surgery. Prescriptions of generic drugs could facilitate cheaper treatment for patients. Hence, our study on analysis of prescriptions of glaucoma patients showed a remarkable restraint on prescribing and an awareness to avoid polypharmacy and irrational drug combinations.

CONCLUSION

Prescription writing errors were at its minimum thereby avoiding irrational prescriptions. Duration of treatment and prescribing by generic name were very low. The glaucoma study concludes with overall impression of rational prescription at maximum places.

However it needs improvements in areas like duration of therapy which were missing in some cases. Generic prescribing was least seen which adds to the economic burden making the medications expensive as per the patients perspective and would indirectly result in non compliance. It is thus necessary to make prescribers aware about the use of drugs, importance of prescribing drugs with generic names and in patients point of view, the factor of cost effectiveness. Also, there is a need for the development of prescribing guidelines and educational initiatives to encourage the rational and appropriate use of drugs. This kind of studies where prescriptions are audited at regular intervals would make the prescribers more conscious and also would bring an end to the varied side effects encountered due to polypharmacy. Improvement through continuous education is desired on the part of prescribers to ensure a good standard of care. Drug information services should be provided to the prescribers at constant time intervals. The essential drugs should also be readily available at the hospital set up. Other departments therefore should actively participate in conducting such studies for benefits and safety of the patient. The prescriptions can then be re-audited to measure the impact of intervention. This will help in rationalizing the prescription practices based on the feedback from these studies. Thus, periodical auditing of the prescriptions will help to measure the impact of intervention on the prescribing pattern.

CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest to disclose.

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