Tropical Journal of
Medicine & Dental Practice

Website: http://www.tjmdp.org

Open Access

Original Research Article

Trop J Med Dent Pract
September 2020;1(1): 1-5
doi: https://doi.org/10.47227/tjmdp/v1i1.1

Drug prescribing in the management of glaucoma at the ophthalmology clinic in a tertiary health facility in South-South Nigeria

Kehinde A Ganiyu[1]*
Temitope A Ojo[2]
Goodluck AR Berikebuna[1]

[1]Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, Niger Delta University, Amassoma, Wilberforce Island, Bayelsa State, Nigeria

[2]Department of Ophthalmology, Federal Medical Center, Yenagoa, Bayelsa State, Nigeria

***For correspondence:**

Tel: +2347031380705
Email: pharmkenny@gmail.com

Received: 11 Aug 2020
Accepted: 13 Aug 2020

Abstract

Background: *Glaucoma is among the leading causes of blindness in Nigeria and the world over. Hence, there is a need to study outcomes of its medication management, locally. The purpose of this study was to evaluate drug prescribing in the management of glaucoma at the eye clinic of Federal Medical Centre, Yenagoa, Bayelsa State, Nigeria.*
Methods: *Case notes of 102 patients who presented at the Federal Medical Centre, Yenagoa for glaucoma management from January to December 2018 were purposively selected. They were assessed for drug prescribing, and change in intraocular pressure (IOP) and cup-to-disc ratio (CDR) at fourth-month from baseline of therapy.*
Results: *Each of the patients was placed on average of 2.64±0.96 anti-glaucoma drugs as at fourth-month of therapy. Timolol (35.6%), latanoprost (25.9%) and dorzolamide (13.7%) were the most prescribed. Latanoprost/timolol and dorzolamide/timolol, each prescribed for 29 (50.0%) of the patients, were the main anti-glaucoma drugs prescribed as fixed-dose combinations. On the average, IOPs (mmHg) reduced by 2.46 ($p<0.05$) and by 2.37 ($p<0.05$) in the left and right eyes, respectively at fourth-month from the baseline of therapy. Meanwhile, there was no significant increase ($p>0.05$) in the CDRs for either the left or the right eyes.*
Conclusion: *Rational prescribing was observed in the study, with each of the patients receiving an average of 2.64±0.96 anti-glaucoma drugs per encounter, notably timolol and latanoprost. IOP control was optimal while the average change in CDRs was negligible for both eyes at the fourth-month of therapy.*

Keywords: *Chronic open-angle glaucoma; Cup-to-disc ratio (CDR); Drug prescribing, Intraocular pressure (IOP); Niger Delta Area*

Introduction

Glaucoma is a neurodegenerative disorder, which is characterized by progressive structural changes to the optic nerve head with resultant functional defects in the affected patient's visual field [1]. Currently, it is the leading cause of irreversible visual loss worldwide [2], and has been reported to be responsible for about 15% of total global burden of blindness [3]. In addition, about 76 and 111.8 million people are expected to present with glaucoma by year 2020 and 2040, respectively [4].

Prevalence of glaucoma is highest among people of African descent and primary open angle glaucoma (POAG) accounts for the most encountered [4]. Thinner corneas and larger optic nerves among blacks compared to members of other races have been noted to be responsible for their highest vulnerability to developing glaucoma [5]. Meanwhile, Asians have second largest prevalence of the disease, of which primary angle closure glaucoma (PACG) is the most reported [4]. A report from the Nigeria National Blindness and Visual Impairment Survey indicated that between 1.1 to 1.4 million adult Nigerians have glaucoma. According to this report, the Igbos from the South-Eastern part of Nigeria are the most affected among the three major homogenous ethnic groups in the country [6].

The goal of management of glaucoma is to prevent further deterioration of optic nerves in the affected eyes. To achieve the foregoing, treatment is mainly directed towards reducing raised intraocular pressure (IOP), which has been established to exhibit causal relationship with the disease condition. Fortunately, a number of treatment modalities are available of which drug therapy is the commonly prescribed. When medications are indicated, they are either prescribed as monotherapy or in combinations depending on the level of the IOP and the cup-to-disc ratio (CDR), which is a measure of extent of optic nerve damage [7, 8].

For medication management of glaucomatous eyes, available treatment guidelines favour selection from an array of IOP lowering drugs, which are mostly prescribed as eye drops. They include prostaglandin analogs, beta blockers, alpha agonists, carbonic anhydrase inhibitors, and rho kinase inhibitors among others. However, a number of concerns have been raised regarding effectiveness of medication use in glaucoma. These include issues bordering on side effects of the drug(s), patient forgetting to administer drug(s) regularly, and cost of the prescribed drugs [8]. Notwithstanding, use of ocular hypotensive drugs remain the most readily acceptable form of glaucoma management [1], particularly in resource limited settings like Nigeria.

This study was carried out to evaluate drug prescribing and the outcomes of therapy in the management of glaucoma at the eye clinic of Federal Medical Centre (FMC), Yenagoa, Bayelsa State, Nigeria.

Methods

Setting

The study was conducted at the ophthalmology clinic of a Federal Medical Center (FMC), which is located in Yenagoa, Bayelsa State, South-South Nigeria. Yenagoa is the capital, and the most populated of all Local Government Areas in Bayelsa State [9]. The FMC serves as a referral center for other health facilities in the State, and it is equipped with 334 functional bed spaces. Three qualified ophthalmologists, 6 optometrists, and 4 ophthalmic nurses provide specialized eye and vision care at the ophthalmologic clinic.

Study design

Approval (FMCY/REC/EAF/2018/SEPT/0186-0739) for the study was granted by the Research Ethics Committee of the FMC, Yenagoa, Bayelsa State, Nigeria. The study involved retrospective assessment of all documented 308 case notes of patients who presented at the ophthalmology clinic of the study center from January to December 2018 for routine eye care. Of these, 102 who were diagnosed with glaucoma were purposively retrieved for further study.

Pertinent data collected included patients' socio-demographics, medications prescribed and relevant clinical variables comprising intraocular pressure (IOP) and cup-to-disc ratio (CDR) values. The antiglaucoma drugs prescribed, including patients' IOP and CDR values at baseline and fourth-month of therapy were noted and compared as appropriate.

Outcomes measures were pattern of ocular hypotensive prescribing, control of IOP and change in CDR values following initiation of therapy.

Statistical analyses

Data generated were analyzed using Statistical Package for Social Sciences (SPSS) v23 and GraphPad Instat v3.10 for Windows (GraphPad Software, San Diego California, USA) and were expressed using descriptive statistics. Mean values and categorical variables were compared using Student t-test and Chi-squared test, respectively, while a 2-tailed p-value < 0.05 was considered significant.

Results

Some patients (102) presented with cases of mainly bilateral open angle glaucoma within the study period. Of these, 65 (63.7%) were males, while 37 (36.3%) were females ($p < 0.05$). Average patient's age was 49 ± 17.13 years, and majority were either business owners or artisans (41.2%), retired (15.7%), and students (14.7%) among others (Table 1).

Table 1: Patients' socio-demographics

Patients' characteristics	N (%)
Gender (n = 102)	
Male	65† (63.7)
Female	37† (36.3)
Age (years), (n = 102)	
< 18	3 (2.9)
18 – 30	14 (13.7)
31 – 40	9 (8.8)
41 – 50	37 (36.3)
51 – 60	14 (13.7)
≥ 61	25 (24.5)
Occupation (n = 102)	
Business/artisan	42 (41.2)
Retired	16 (15.7)
Students	15 (14.7)
Civil servant	13 (12.7)
Farmer	11 (10.8)
Unemployed	5 (4.9)

n, total number of patients; N, number of observations; Mean ± SD; SD, standard deviation; Average age of patients, 49 ± 17.13; †$\chi^2 = 14.294$, df = 1, $p < 0.001$

Table 2: Anti-glaucoma drugs prescribed for patients

Characteristics of anti-glaucoma drugs prescribed	At baseline	At fourth month	Statistical test
Types of anti-glaucoma drugs			-
Individual anti-glaucoma drugs prescribed	(n = 281)	(n = 270)	
Gutt. timolol	101 (35.9)	96 (35.6)	
Gutt. latanoprost	70 (24.9)	70 (25.9)	
Gutt. dorzolamide	38 (13.5)	37 (13.7)	
Tab. acetazolamide	32 (11.4)	34 (12.6)	
Gutt. brinzolamide	15 (5.3)	14 (5.2)	
Gutt. betaxolol	15 (5.3)	10 (3.7)	
Gutt. brimonidine	5 (1.8)	4 (1.5)	
Gutt. pilocarpine	3 (1.1)	3 (1.1)	
Gutt. epinephrine	2 (0.7)	2 (0.7)	
Anti-glaucoma drugs prescribed as fixed-dose combination	(n = 59)	(n = 58)	-
Gutt. latanoprost + timolol	28 (47.5)	29 (50.0)	
Gutt. dorzolamide + timolol	31 (52.5)	29 (50.0)	
Average number of anti-glaucoma drugs prescribed	Mean ± SD	Mean ± SD	Student's t-test for average number of drugs prescribed per patient
Mean number of anti-glaucoma drugs prescribed per patient	2.75 ± 0.89	2.64 ± 0.96	p = 0.3971

Gutt, eye drop; Tab., tablet

Table 3: Intraocular pressure (IOP) and cup-to-disc ratio (CDR) values at baseline and fourth month of anti-glaucoma drug therapies

Clinical variables	At baseline, (Mean ± SD)	At fourth month, (Mean ± SD)	Student's t-test (p-value)	Difference in means
Average IOP in the left eyes (mmHg)	22.29 ± 7.57	19.83 ± 6.63	0.0144	2.46
Average IOP in the right eyes (mmHg)	21.90 ± 8.00	19.53 ± 6.78	0.0235	2.37
Average CDR in the left eyes	0.63 ± 0.22	0.66 ± 0.21	0.3203	0.03
Average CDR in the right eyes	0.62 ± 0.21	0.65 ± 0.21	0.3089	0.03

n, 102; Normal IOP, 10 – 21 mmHg [10]; Normal CDR, ≤ 0.5 [11]

A total of 270 anti-glaucoma drugs were prescribed as at fourth-month of therapy, of which majority of the patients were placed on timolol (35.6%), followed by latanoprost (25.9%), and dorzolamide (13.7%), among others. Dorzolamide in combination with timolol (50.0%) and latanoprost also combined with timolol (50.0%) were the main anti-glaucoma medications prescribed as fixed-dose combinations. Virtually all of the drugs were prescribed as eye drops, except acetazolamide, which was ordered as tablet. In all, each of the patients received average of 2.64 ± 0.96 anti-glaucoma drugs at the fourth-month of therapy considered (Table 2).

On the average, respective IOP (mmHg) measured at baseline and fourth-month of therapy among the patients reduced from 22.29 ± 7.57 to 19.83 ± 6.63 (difference in means, 2.46; $p < 0.05$) in the left eyes and from 21.90 ± 8.00 to 19.53 ± 6.78 (difference in means, 2.37; $p < 0.05$) in the right eyes. Consequently, average CDR values recorded for the patients increased slightly from 0.63 ± 0.22 to 0.66 ± 0.21 (difference in means, 0.03; $p > 0.05$) for the left eyes and from 0.62 ± 0.21 to 0.65 ± 0.21 (difference in means, 0.03; $p > 0.05$) for the right eyes, from baseline to fourth-month of therapy, respectively (Table 3).

Discussion

Each of the patients who presented at the study centre

for the management of glaucoma within the study period was placed on average of 2.64±0.96 anti-glaucoma drugs. These comprised mostly timolol, latanoprost, and dorzolamide eye drops. Meanwhile, anti-glaucoma drugs that were prescribed as fixed-dose combinations were mainly latanoprost/timolol and dorzolamide/timolol. At fourth-month from baseline of therapy, average IOP reduction was optimal, while average increase in CDR was negligible for both eyes, among all patients treated.

That each of the patient seen in this study was prescribed average of 2.64±0.96 anti-glaucoma drugs per encounter is probably in keeping with the guidelines, which posit that maximum medication therapy for glaucoma should be that which encourages compliance and tolerance on the part of the patient while keeping in mind the need to achieve optimal therapy [12]. Meanwhile, most of the patients received the beta blocker, in the form of timolol eye drop, which is similar to the finding of a study conducted by Advani and Jadhao [13]. Timolol is an effective ocular hypotensive agent, and it is the least expensive of all anti-glaucoma drugs. The relative affordability of timolol eye drop has been noted as one of the reasons it is favoured over other anti-glaucoma drugs, as this encourages adherence to therapy [13]. Second to timolol, latanoprost eye drop was widely prescribed in this study probably due to its established higher efficacy and better control of ocular hypertension compared to other drugs used in the management of glaucoma [14, 15]. Meanwhile, dorzolamide, which is the third most prescribed anti-glaucoma in this study has been reported to be a suitable alternative to timolol. This is because it is devoid of respiratory side effects that are often seen in patients on beta-blockers such as timolol eye drops [16].

On the average, elevated IOPs in the left and the right eyes were well controlled among all patients who presented with glaucoma within the study period. Resultantly, the changes in their average CDR values, which assess worsening of glaucoma in both eyes were negligible. The foregoing further confirmed the importance of controlling IOP within the normal range in preserving vision in glaucomatous eyes given the link between high CDR values *cum* degeneration of retinal nerves and progressive visual loss. However, experts have noted that, although controlling IOP in a glaucomatous eye is clinically important, it does not preclude the possibility of progression in the functional defect of the optic nerve head with consequent visual field deterioration in certain patients [14]. In explaining this phenomenon, Rumelt and Schreibe [17] highlighted a number of reasons. These include “high IOP fluctuations”, “increased IOP in supine position (at bed time)”, “increased IOP when sleeping on the affected eye(s)”, administration of antihypertensive drugs at bed time, which may precipitate reduction in blood flow to the eyes, and continuation of neuronal apoptosis. Fortunately, a number of recommendations have been advanced to prevent further visual field loss in patients with controlled glaucoma and they comprise early surgery, advising patients to sleep at 20-30^{o} head-up position using appropriate pillow and not sleeping on their affected eye(s). Other recommendations include using antihypertensive drug(s) by hypertensive patient with glaucomatous eye(s) when fully awake and active and not at bed time as well as using medications capable of abolishing or slowing neuronal apoptosis [17].

An important limitation of this study is that, level of patients’ compliance with the anti-glaucoma drugs was not rated. Others include, lack of equipment for effective assessment of functional defects of the optic nerve (automated perimeter), and the fact that, only one out of the two major referral centres, which provide eye care services in Bayelsa State was studied. Therefore, findings from this work may not be generalized to the general population of patients receiving treatments for glaucoma at other centres in Bayelsa State.

Conclusion

In this study, it was observed that each of the patients who presented for glaucoma treatment at the study centre within the study period received average of 2.64±0.96 anti-glaucoma drugs per encounter. The most prescribed of these drugs were timolol, latanoprost, and dorzolamide. On the average, control of IOP was optimal among the patients studied. As a consequence, changes in the CDR values, which indicate status of glaucoma in the eyes treated were negligible at the fourth-month of therapy considered.

List of abbreviations

CDR: cup-to-disc ratio, IOP: intraocular pressure, mmHg: millimeter of mercury, SD: standard deviation

Declarations

Ethics approval and consent to participate

Approval (FMCY/REC/EAF/2018/SEPT/0186-0739) for the study was granted by the Research Ethics Committee of the FMC, Yenagoa, Bayelsa State, Nigeria.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

TAO is a consultant ophthalmologist at the study centre. No conflict of interest exists for KAG and GARB.

Funding

No funding was received for this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. KAG conceived and designed the study, analysed the data, and wrote the manuscript. GARB collected and managed the data. TAO revised the manuscript critically. All authors read and approved the manuscript for publication.

Acknowledgements

The role played by the Research Ethics Committee of the Federal Medical Center, Yenagoa, Bayelsa State in granting the approval (FMCY/REC/EAF/2018/SEPT/0186-0739) for this study is highly appreciated. The assistance rendered by the staff of the eye clinic used for the study is also appreciated.

References

1. Schellack N, Schellack G, and Bezuidenhout S. Glaucoma: a brief review. S Afr Pharm J 2015; 82(5): 18-22. Available from: https://www.researchgate.net/publication/282792352_Glaucoma_A_brief_review
2. The International Agency for the Prevention of Blindness. Glaucoma. IAPB, 2019 [cited 2019 Sept 08]. Available from: https://www.iapb.org/knowledge/what-is-avoidable-blindness/glaucoma/
3. World Health Organization. The global impact of glaucoma. Bulletin of the World Health Organization 1994; 72(3):323-326. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2486713/
4. Tham Y, Li X, Wong TY, Quigley HA, Aung T, and Cheng C. Global Prevalence of Glaucoma and Projections of Glaucoma Burden through 2040. Ophthalmol 2014; 121:2081-2090. doi: 10.1016/j.ophtha.2014.05.013.
5. Ou Y. How Glaucoma Affects Different Ethnic Groups. BrightFocus Foundation 2017 [cited 2019 Oct 17]. Available from: https://www.brightfocus.org/glaucoma/article/how-glaucoma-affects-different-ethnic-groups
6. Kyari F, Entekume G, Rabiu M, Spry P, Wormald R, Nolan W, Murthy GVS, Gilbert CE, and On behalf of the Nigeria National Blindness and Visual Impairment Study Group. A Population-based survey of the prevalence and types of glaucoma in Nigeria: results from the Nigeria National Blindness and Visual Impairment Survey. BMC Ophthalmol 2015; 15:176. doi: 10.1186/s12886-015-0160-6.
7. 2015 Task Force for Glaucoma Eye Care. International Council of Ophthalmology Guidelines for Glaucoma Eye Care. International Council of Ophthalmology, First Edition 2016; 1-20. Available from: http://www.icoph.org/downloads/ICOGlaucomaGuidelines.pdf
8. Radhakrishnan S and Iwach A. Glaucoma Medications and their Side Effects. Glaucoma Research Foundation 2016 [cited 2019 Dec 8]. Available from: https://www.glaucoma.org/gleams/glaucoma-medications-and-their-side-effects.php
9. Brinkhoff T. Bayelsa State in Nigeria. City Population – statistics, maps & charts 2017 [cited 2019 Dec 25]. Available from: https://www.citypopulation.de
10. Wang YX, Xu L, Wei WB, Jonas JB. Intraocular pressure and its normal range adjusted for ocular and systemic parameters. The Beijing Eye Study 2011. PLoS ONE 2018; 13(5): e0196926. doi: https://doi.org/10.1371/journal.pone.0196926
11. Singh M, Singh M, and Virk JK. A simple approach to Cup-to-Disc Ratio determination for Glaucoma Screening. IJCSC 2015; 6(2): 77- 82. doiI: 10.090592/IJCSC.2015.602
12. Filipe J, Sobral I, Cardoso J, Faria P, and Pereira JM. What is exactly the maximum medical therapy tolerated by patients? GRUPO PORTUGUES DE LA GLAUCOMA 2018 [cited 2019 Dec 11]. Available from: http://www.glaucoma-answers.org/en/home/what-exactly-maximum-medical-therapy
13. Advani M and Jadhao T. Study of prescription pattern of antiglaucoma drugs used in treatment of primary open angle glaucoma in ophthalmology outpatient department of a tertiary care hospital. Int J Basic Clin Pharmacol 2018; 7:2228-33. doi: http://dx.doi.org/10.18203/2319-2003.ijbcp20184332
14. Singh K and Shrivastava A. Medical management of glaucoma: principles and practice. Indian J Ophthalmol 2011 Jan; 59(Suppl1):S88. doi: 10.4103/0301-4738.73691
15. Russo A, Riva I, Pizzolante T, Noto F, and Quaranta L. Latanoprost ophthalmic solution in the treatment of open angle glaucoma or raised intraocular pressure: a review. Clin Ophthalmol 2008: 897-905. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2699817/pdf/co-2-897.pdf
16. Diggory P and Franks WA. Glaucoma therapy may take your breath away. Age and Ageing 1997; 26: 63-67. Available from: https://doi.org/10.1093/ageing/26.2.63
17. Rumelt and Schreibe. Why Do Patients with Controlled Glaucoma Continue to Lose Their Vision? IntechOpen 2018; Chapter 2: 23–32 [cited 2019 Dec 10]. doi: http://dx.doi.org/10.5772/intechopen.79764