Original article:

Antiglaucoma medication utilization and therapeutic outcome among Nigerian older persons with primary open angle glaucoma

SA Saka[1], BO Onyeukwu[2], UIH Eze[3]

Abstract:

Background: Primary open angle glaucoma (POAG) is associated with older age. Antiglaucoma medications (AGM) are the cornerstones in the management of POAG. However, the relationship between AGM utilization, patients' medication adherence (MA) and the therapeutic outcome remains largely unexplored among older persons. ***Objective:*** This study aimed to evaluate AGM utilization patterns, patients' MA and intraocular pressure (IOP) reduction among older persons. ***Methods:*** This study was a 5-year retrospective review of medical records of consecutively selected older persons diagnosed of POAG at a University teaching hospital, in southwest Nigeria. Older persons were included if (1) aged 65 years and above, (2) had attended the outpatient ophthalmic clinics of the hospital between January 2010 and December 2015 (3)had at least 1-year clinic attendance during the period. The relationship between AGM utilization, patients' self-reported MA and physicians' comments on IOP was evaluated. A bivariate analysis was carried out to determine associations between variables and MA. Factors associated with IOP reduction were determined using a logistic regression. $p<0.05$ was considered statistically significant. ***Results:*** The carbonic anhydrase inhibitors comprised (66/191; 34.6%) of the total 191 AGM prescriptions. Majority of the participants (36/60; 60.0%) had reduced IOP with AGM alone, of which (13/36;36.1%) were on triple AGM. The participants' MA ($p=0.01$) and number of AGM ($p=0.04$) were significantly associated with IOP reduction among the participants in a logistic regression. ***Conclusion:*** The number of AGM prescribed and the patients' medication adherence can influence IOP reduction among older persons with POAG.

Keywords: Primary open angle glaucoma (POAG); Antiglaucoma medications (AGM), intraocular pressure (IOP)

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Introduction

Glaucoma is a major cause of irreversible blindness globally.[1] The Africans are more burdened by the disease and have a greater risk of the disease progressing to blindness than other people in the world.[2] In Nigeria more than 5% of the population aged ≥ 40 years were already affected in 2007.[3] The Primary Open Angle Glaucoma (POAG) which is the most prevalent glaucoma entity in Africa is reported to blind 1% of Africans and approximately 150,000 people older than 40 years in Nigeria.[4] Many reasons including poor access to ophthalmic care, cost of antiglaucoma medications, lack of education regarding the disease and poor medication adherence (MA) among the diagnosed patients accounted largely for the observation. [5,6]

1. SA Saka, Department of Clinical Pharmacy and Biopharmacy, Olabisi Onabanjo University, PMB 2022, Sagamu, Nigeria. Phone Number: +2348055448123, Email: sulsak01@yahoo.com; ajibola.saka@oouagoiwoye.edu.ng
2. BO Onyeukwu, Department of Clinical Pharmacy and Biopharmacy, OlabisiOnabanjo University, PMB 2022, Sagamu, Nigeria. Phone Number: +2348116837287
3. UIH Eze, Department of Clinical Pharmacy and Biopharmacy, OlabisiOnabanjo University, PMB 2022, Sagamu, Nigeria. Phone Number: +2347060627667. Email: ifyeze3000@gmail.com

Correspondence to: SA Saka, Department of Clinical Pharmacy and Biopharmacy, Olabisi Onabanjo University, PMB 2022, Sagamu, Nigeria.
Email: sulsak01@yahoo.com; ajibola.saka@oouagoiwoye.edu.ng

The POAG results from the optic nerves damage due to elevation of ocular pressure.[7] The disease is associated with genetics, older age, intraocular pressure (IOP) and environmental influence.[4,8]However, a raised IOP seems to be the only treatable risk factor for POAG, and is thus the target of many treatment procedures such as surgery, laser therapy and AGM.[9,10] Surgery is however reportedly unpopular in Africa due to the scarcity of ophthalmologists on the continent and its higher failure rate among African patients.[4,11]

The AGM have a proven record of efficacy in reducing the IOP and reducing the risk of visual field loss in patients with POAG.[12] There are 5 different classes of AGM currently being used in clinical practice. These include beta adrenergic antagonists (Timolol, Betaxolol), Prostaglandin analogues (Latanoprost, Travoprost), alpha adrenergic agonists (Briminidine), carbonic anhydrase inhibitors (Brinzolamide, Acetazolamide) and cholinergic agents (Pilocarpine).[13] These medications are either used alone or in combination. However, the decision to combine, switch and adjust a medication is often a grey area in clinical practice and variation exists among ophthalmologists.[14] However, in the choice of any medication therapy option, the efficacy, patient's adherence and cost effectiveness of therapy are important.[10]

The POAG requires chronic medications and like any other chronic diseases, the clinical outcome depends significantly on the patients' MA. Medication adherence in POAG is influenced by many factors including patient's socio-economic demographics, cost of AGM, difficulty in eye drops administration especially among the older persons and the side effects of the AGM.[6,15,16]

The AGM are the cornerstones in the management POAG among older persons. However, the relationship between AGM utilization, patients' MA and IOP are relatively rare in the literature. This study aimed to evaluate associations between AGM utilization, patients' MA and IOP reduction among older persons.

Methods

A 5-year retrospective study was carried out among older persons at Olabisi Onabanjo University teaching hospital, Sagamu, Nigeria, using a medical chart review. Eligible participants were included in the study if aged 65 years and above, attended the ophthalmology outpatient clinics between 1st January 2010 and 31st December 2015, had a diagnosis of POAG and had at least a year clinic attendance, with a history of AGM prescription for at least 1year during the period. Eligible participants with incomplete information in their medical charts and those whose medical records were not available at the medical record office at the time of the data collection were excluded.

The participants' medical records were identified using the clinic register which had unique case serial numbers to differentiate between the first-time patients and those on repeat visits. The medical records of eligible participants were consecutively selected. Information including participants' socio-demographics, medical history, medication history, physicians' notes on participants' MA and IOP were extracted from the participants' medical records. The total number of older persons with glaucoma registered in the facilities within the study period was noted and this was confirmed by records of diagnosis in the patients' medical records. Where discrepancies existed between the diagnosis on the register and the participants' medical records, the diagnoses in the participants' records were adopted. IOP reduction was considered as the therapeutic outcome.

The study participants were classified into 3 groups based on the level of IOP reduction. The classes included participants with reduced IOP on medications alone, participants with fluctuating IOP on medications alone and participants with reduced IOP after surgery.

Evaluation of the prevalence of POAG, antiglaucoma medication utilization and therapeutic outcome among the study participants

The prevalence of POAG diagnosis was determined using the total number of older persons with diagnosis of glaucoma as denominator. The AGM utilization pattern was assessed using a retrospective analysis of medications prescribed to individual participants. Antiglaucoma medications were categorized using the pharmacological classification. The number and names of AGM prescribed for individual participants before the last visit was noted. Where acetazolamide was prescribed, the frequency of potassium supplements with acetazolamide prescriptions was evaluated. Physicians' comments on IOP at the participants' last visits, and notes on participants' MA were retrieved from the records.

Determination of the cost of antiglaucoma medications

The costs of AGM were determined using the

prevailing average wholesale prices in the local drug market at the time of the study. The average cost for three commonly prescribed generic brands of each AGM in the clinic was used except where no generic existed in the Nigerian market at the time of study. The cost of 5ml bottles was used for all the topical medications. A standard application method for topical application was used to determine the number of drops in the 5ml bottle. A likely 10% wastage due to participants' misapplication was deducted. The total cost of AGM in each prescription was then calculated. The monthly cost of the prescribed AGM was calculated for each participant using the dosing patterns and the average cost of each medication.

Association between cost of AGM, medication adherence and IOP

Physicians' notes on MA were based on participants' self-reports and this was applied in the study. The outcome of therapy was determined by the reduction in IOP as recorded in the physicians' notes.

Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS version 20). The results were presented using descriptive statistics such as frequencies and percentages. Associations were determined using Chi-squared test. Factors associated with IOP reduction among the participants were determined using a logistic regression model.P<0.05 was considered statistically significant.

Ethical clearance: The study was carried out between September 2016 and January 2017 after approval from the hospital's health research ethics committee. The ophthalmology department also granted permission for the study.

Results

Prevalence of POAG

Eighty-two medical records of older persons with glaucoma were available for assessment based on the selection criteria. Majority of the glaucoma patients assessed (68/82; 82.9%) had POAG. The remaining (14/82; 17.1%) had closed angle glaucoma. Among the older persons with POAG, only (60/68; 88.2%) were subsequently included in the study. The remaining (8/68; 11.8%) were excluded due to unusable information.

Patients' socio demographics

Table 1 presents the socio-demographic characteristics of the study participants. The participants (60/68; 88.2%), mean ages 73.7 ±5.5 years were evaluated. Majority were males (41/60; 68.3%) and (55/60; 91.7%) were married.

Table1: The socio-demographics of the participants

Variables		Frequency	Percentage	p-value*
Gender	Male	41	68.3	0.03
	Female	19	31.7	
Age	65-69years	15	25.0	0.05
	70-74years	27	45.0	
	75-79 years	10	16.7	
	80years and above	8	13.4	
Marital status	Single	5	8.3	0.004
	Married	55	91.7	
Education qualification	No formal education	40	66.7	0.02
	Primary	5	8.3	
	Secondary	2	3.3	
	Tertiary	13	21.7	
Occupation	Private employment	28	46.7	0.08
	Public employment	4	6.7	
	Retired	28	46.7	

*Chi-square P-value

Majority of the patients (27/60; 45.0%) had 2 diseases, (13/60; 21.7%) had multiple co-morbidities while the remaining (20/60; 33.3%) had a single disease. Hypertension alone (7/60; 11.7%) or with comorbidity (9/60; 15.0%), followed by cataract (6/60; 10.0%) alone and with co-morbidity (3/60; 5.0%) were the most diagnosed diseases among the study population.

Utilization of antiglaucoma medications

Table 2 presents the antiglaucoma medication utilization among the study participants. Of the 191 AGM encounters, carbonic anhydrase inhibitors (66/191; 34.6%) were the most frequently prescribed class of AGM among the study participants followed by beta-adrenergic antagonists (61/191; 31.9%), prostaglandin analogues (50/191; 26.2%) and cholinergic (14/191; 7.3%).Acetazolamide (43/191; 22.5%) was the only medication prescribed by oral route. The remaining (148/191; 77.5%) were topical applications. Majority of Acetazolamide prescriptions (41/43; 95.3%) included potassium supplements. The average monthly cost of AGM among the participants was #12,440 ($83) at (#150 to a $1).

Table 2: Antiglaucoma drug utilization among the participants

Antiglaucoma agents	Frequency	Percentage
Timolol drop	56	29.3
Latanoprost drop	48	25.1
Brinzolamide drop	23	12.0
Acetazolamide tab	43	22.5
Pilocarpine drop	14	7.3
Travoprost drop	2	1.0
Betaxolol drop	5	2.6

Association of variables with medication adherence among the study participants

Table 3 presents association between participants' variables and MA. Medication adherence was documented for participants (49/60; 81.7%). Majority of the participants (40 /49; 81.6%) whose MA were documented were adherent to their medications while (9/49; 18.4%) were non-adherent. The participants' age (p=0.25) and the monthly cost of AGM (p=0.68) were not significantly associated with MA.

Table 3: Association of participants' clinical, demographic and medication adherence

Variable	Group	Medication adherence Adherent	Non-adherent	p-value
Age	65-69 years	8(20.0%)	4(44.4%)	
	70-74 years	18(45.0%)	3(33.3%)	0.25
	75-79 years	8(20.0%0	1(11.1%)	
	80 years and above	6(15.0%)	1(11.1%)	
Education qualification	No formal education	27(67.5%)	6(66.7%)	
	Primary	4(10.0%)	1(11.1%)	
	Secondary	1(2.5%)	0(0.0%)	0.97
	Post-secondary	8(20.0%)	2(22.2%)	
Gender	Male	28(70.0%)	7(77.8%)	
	Female	12(30.0%)	2(22.2%)	0.64
Cost of AGM	≤#5,000	5(10.2)	4(8.2)	
	>#5,000-<10,000	5(10.2)	7(14.3)	0.68
	≥#10,000	16(32.7)	12(24.5)	

Therapeutic outcome

Table 4 presents factors associated with IOP reduction among the participants in a regression model. The majority of the study population (36/60; 60.0%) had reduced IOP with AGM alone, (15/60; 25.0%) had fluctuating IOP on medication alone. A few (2/60; 3.3%) had reduced IOP after surgical intervention, while (7/60; 11.7%) had no IOP documented. Many patients with reduced IOP (13/36; 36.1%) were on triple AGM, of which (9/13; 69.2%) were on a combination of timolol, latanoprost and acetazolamide.

Table 4: Factors associated with IOP reduction in a logistic regression model

Variable	95%CI	p-value
Age	-0.02-0.04	0.42
Gender	-0.53-0.13	0.22
Level of education	-0.22-0.05	0.19
Co-morbidity	-0.06-0.04	0.66
Medication adherence	0.4-1.18	0.01
Cost of medication	-0.12-0.13	0.96
Number of medication	0.12-2.16	0.04

Discussion

This study assessed the relationship between AGM, patients' MA and IOP reduction among older persons with diagnosis of POAG in Nigeria. The POAG was more frequently diagnosed than closed angle glaucoma among the study population. This observation was consistent with previous reports on the prevalence of POAG among the African general population.[8,17]The prevalence in this study (82.9%) was comparable with the national prevalence of POAG in Nigeria (86.0%) and 87.0% earlier reported in Epic-Norfolk Eye study in Norwich.[3,18] The prevalence of POAG in this study was however lower than 94.5% reported in the urban West African population.[2] This study observation is significant considering the high rate of blindness and economic burden associated with POAG in Africa and in Nigeria specifically.[4] The observation of this study should necessitate a public health policy towards reducing the disease in the country. The males were also more affected with POAG than the females in this study. This observation concurred with many reports on gender difference in the prevalence of POAG among glaucoma patients in Nigerian and many parts of the globe. [3,17,18]

Medication utilization pattern reflects the knowledge, experience and the practitioners' stance on disease management approach. It may also depict the state of healthcare delivery in a facility.[19] The carbonic anhydrase inhibitors were the most frequently prescribed AGM class in this study. This observation contradicted previous reports that showed beta adrenergic antagonist as the most frequently utilized AGM among POAG patients.[20] This result was surprising. This is because carbonic anhydrase inhibitors are recommended as second line medication therapy in POAG. They are more expensive and require more frequent dosing than the beta-adrenergic antagonist class of antiglaucoma.[13] Beta-adrenergic antagonists are however associated with side effects such as hypoglycemia, bronchospasm, bradycardia, dry eyes and depression.[12] These side effects may add to the disease burdens of older persons. It is therefore possible that the prescribers preferred the carbonic anhydrase inhibitors to beta-adrenergic antagonists in older persons due to the afore-mentioned side effects of the beta-adrenergic antagonists. Timolol, a beta-adrenergic antagonist was the most prescribed antiglaucoma monotherapy among the study populationsimilar to previous reports on antiglaucoma utilization patterns among POAG patients. [20,21]

In this study the combination of latanoprost, timolol and acetazolamide treatment regimen appeared to be the most effective therapy among the participants. The majority of the participants with reduced IOP on medication alone were on this triple regimen. However, the cost implication of this triple regimen may be unbearable for the older persons, especially in a country such as Nigeria where government supports for older persons are almost non-existent. Latanoprost (Prostaglandin analogue) when used as a first line monotherapy in POAG, or in combination with beta-adrenergic antagonistproduces good hypotensive effect.[12,13]Acetazolamide (carbonic anhydrase inhibitor) is often prescribed by oral route and administered three times daily. However, acetazolamide in many cases will need to be supplemented with potassium to minimize the hypokalemia-induced paresthesia associated with the medication.[22] This additional prescription increases the cost of therapy.

The average monthly cost of medication in this study was #12,440 ($83) higher than #6,000 ($40) was previously reported in the country.[4]This could however be associated with the inflation in the country. This monthly spending on AGM was high considering the Nigeria national monthly minimum wage of #18,000 ($120). The average monthly cost of antiglaucoma in this study was equivalent to two-third of the minimum wage. In addition, the older persons in Nigeria were not under any insurance cover at the time of this study. A previous study in the country associated a high cost of eye drops to disease progression to blindness among patients with POAG.[16,22] In addition, high cost of medication can reduce access to ophthalmic care among older persons. There is therefore the need for the Nigerian government to consider subsidizing the AGM, especially for the older population.

Antiglaucoma medications have proven records of lowering IOP and reducing vision loss among POAG patients.[1,12,13] However, patients' adherence to AGM is critical to achieving the goal of the therapy. Majority of the study population (81.6%) were adherent to their medication, based on patients self-reported MA, documented by the physicians. This observation was unexpected considering the cost of treatment and the prevailing economic conditions in Nigeria during the period of study. In addition, majority of the study population also had other comorbidities with additional health care costs. The observation of this study contradicted previous reports that reported lower rate of MA among the general population

of glaucoma patients.[4,15] The result of this study was however consistent with the observation of a similar study that reported 89% MA among POAG patients.[23]The traditional support system for older persons in the Nigerian society could however have played a role in this study observation. In addition, the fear of blindness could also have motivated the patients to adhere to their AGM.[16]Blindness impacts on physical, psychological and the economic well-being of an individual especially in the African society. The patients could also have over-estimated their MA. This is a known fact among patients.[24]

The patients' MA significantly influenced therapeutic outcome (IOP reduction) in this study. The result of this study was consistent with previous reports on the influence of MA on therapeutic outcome among glaucoma patients.[9,23] It is worthy of note that among many variables explored, only the number of AGM and MA were consistently associated with IOP reduction. To the best of author's knowledge, this was the first study to identify number of AGS as a predictor of IOP reductions among POAG. It is therefore important that healthcare practitioners design appropriate measures to improve patients MA while they are on multiple regimen.

Limitations

This study was non-probabilistic and the sample size was small. This was however due to the prevalence of disease in the healthcare facility studied. This study was retrospective and therefore much information could not be verified. Many of the patients' charts did not contain IOP measurements in figures and therefore the claim of IOP reduction by the physicians could not be established based on the standard measurement. This study assumed that a milliliter of the eye drops contains 20 drops, however, it is acknowledged that there could be variations in the volume and number of drops between 2 different generic products of the same medication.

Conclusions

The POAG was the most prevalent glaucoma entity among the study population. Triple regimen was associated with positive therapeutic outcome (reduced IOP) among the study population. Patients MA is key to achieving reduced IOP among older persons with POAG. The effectiveness of various combinations of the AGM and other treatment options in reducing IOP should be further explored among older persons. This is necessary to promote value-based healthcare.

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Conflict of interest

The authors declare that they have no competing interests.

Author's contribution:

Data gathering and idea owner of this study: SA Saka, BO Onyeukwu

Study design: SA Saka, BO Onyeukwu, UIH Eze

Data gathering: SA Saka, BO Onyeukwu, UIH Eze

Writing and submitting manuscript: SA Saka, BO Onyeukwu, UIH Eze

Editing and approval of final draft: SA Saka, BO Onyeukwu, UIH Eze

References:

1. Tianjing Li, Lindsley K, Benjamin R, Hwanhee H, Qiyuan S, et al. Comparative Effectiveness of First-line Medications for Primary Open Angle Glaucoma - A Systematic Review and Network Meta-analysis. Ophthalmology. 2016; 123(1): 129-140. https://doi.org/10.1016/j.ophtha.2015.09.005
2. Budenz DL, Barton K, Whiteside-de Vos J, et al. Prevalence of Glaucoma in an Urban West African Population The Tema Eye Survey. JAMA Ophthalmol. 2013 May; 131(5): 651-658. https://doi.org/10.1001/jamaophthalmol.2013.1686
3. Kyari F, Entekume G, Rabiu M, et al. A Population-based survey of the prevalence and types of glaucoma in Nigeria: results from the Nigeria National Blindness and Visual Impairment Survey. BMC Ophthalmology (2015) 15:176 DOI 10.1186/s12886-015-0160-6 https://doi.org/10.1186/s12886-015-0160-6
4. Adio AO, Onua AA. Economic burden of glaucoma in Rivers State, Nigeria. ClinOphthalmol. 2012; 6: 2023-2031. https://doi.org/10.2147/OPTH.S37145
5. Isawumi MA, Hassan MB, Akinwusi PO, et al. Awareness of and attitude towards glaucoma among an adult rural population of Osun State, Southwest Nigeria. Middle East Afr J Ophthalmol. 2014; 21:165-9 https://doi.org/10.4103/0974-9233.129769
6. Newman-Casey PA, Robin AL, Blachley T, et al. . Most Common Barriers to Glaucoma Medication Adherence: A Cross-Sectional Survey. Ophthalmology. 2015 Jul; 122(7): 1308-1316. doi: 10.1016/j.ophtha.2015.03.026 https://doi.org/10.1016/j.ophtha.2015.03.026
7. Nayak B, Gupta S, Kumar G, Dada T, Gupta V, Sihota R. Socioeconomics of long-term glaucoma therapy in India. Indian J Ophthalmol. 2015; 63:20-4 https://doi.org/10.4103/0301-4738.151458
8. Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY.Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology. 2014; 121(11):2081-90. https://doi.org/10.1016/j.ophtha.2014.05.013
9. Rossi GCM, Pasinetti GM, Scudeller L, Radaelli R, Bianchi PE. "Do adherence rates and glaucomatous visual field progression correlate?" EurJ.Ophthalmol. 2011; 21(4): 410-414. https://doi.org/10.5301/EJO.2010.6112
10. Scuderi GL, Pasquale N. Laser therapies for glaucoma: new frontiers. Prog Brain Res. 2008;173: 225-36. https://doi.org/10.1016/S0079-6123(08)01116-3
11. Adekoya BJ, Akinsola FB, Balogun BG, Balogun MM, Ibidapo OO. Patient Refusal of Glaucoma Surgery and Associated Factors in Lagos, Nigeria. Middle East Afr J Ophthalmol. 2013; 20(2): 168-173. doi: 10.4103/0974-9233.110612 https://doi.org/10.4103/0974-9233.110612
12. Sambhara D, Are AA. Glaucoma management: relative value and place in therapy of available drug treatments.Ther Adv Chronic Dis. 2014 Jan; 5(1): 30-43. doi: 10.1177/204062231 https://doi.org/10.1177/2040622313511286
13. TătaruCP, Purcărea VL. Antiglaucoma pharmacotherapy. J Med Life. 2012; 15; 5(3): 247-251.
14. Flanary WE, Myers (Provencher) LA, Alward WLM. Medical management of glaucoma: A primer. EyeRounds.org. posted September 1, 2015; Available from: http://www.EyeRounds.org/tutorials/glaucoma-medical-treatment
15. Abu Hussein NB, Eissa IM, Abdel-Kader AA. Analysis of Factors Affecting Patients' Compliance to Topical Antiglaucoma Medications in Egypt as a Developing Country Model. J.Ophthalmol. 2015.http://dx.doi.org/10.1155/2015/234157 https://doi.org/10.1155/2015/234157
16. Lacey L, Cate H, Broadway DC. "Barriers to adherence with glaucoma medications: a qualitative research study," Eye. 2009; 23 (4): 924-932. https://doi.org/10.1038/eye.2008.103
17. Kapetanakis VV, Chan MP, Foster PJ, Cook DG, Owen CG, Rudnicka AR. Global variations and time trends in the prevalence of primary open angle glaucoma (POAG): a systematic review and meta-analysis. Br J Ophthalmol. 2016; 100(1): 86-93. https://doi.org/10.1136/bjophthalmol-2015-307223
18. Michelle PPC, David CB,Anthony PK Khawaja, et al. Glaucoma and intraocular pressure in EPIC-Norfolk Eye Study: cross sectional study. BMJ. 2017; 358: j3889.doi: 10.1136/bmj.j3889 https://doi.org/10.1136/bmj.j3889
19. Shankar PR, Upadhyay DK, Subish P, et al. Drug utilization among older inpatients in a teaching hospital in Western Nepal. Singapore Med J, 2010;51(1):28.
20. Elfride FS, Kishore SR, Philip S. Prescribing patterns and cost analysis of antiglaucoma medications in a tertiary care teaching hospital. Int J Med Res Rev 2016;4(12):2193-2198.doi:10.17511 /ijmrr. 2016.i12.19.
21. Mahajan HM, Honrao R, Borkar AS, Badwaik RT, Chopade SS, Surwase P.A Drug Utilization Study in Glaucoma Patients in a Tertiary Care Hospital of Central India. J Cont Med A Dent. 2015; 3(2): 44-47. https://doi.org/10.18049/jcmad/329
22. Friedman DS, Hahn SR, Gelb L, et al., "Doctor-patient communication, health-related beliefs, and adherence in glaucoma. Results from the Glaucoma Adherence and Persistency study," Ophthalmology. 2008;115(8): 1320-1327. https://doi.org/10.1016/j.ophtha.2007.11.023
23. Sleath B, Blalock S, Covert D, et al.. The relationship between glaucoma medication adherence, eye drop technique, and visual field defect severity Ophthalmology. 2011; 118(12): 2398-2402. doi: 10.1016/j.ophtha.2011.05.013 https://doi.org/10.1016/j.ophtha.2011.05.013
24. Stirratt MJ, Dunbar-Jacob J, Crane HM, et al. Self-report measures of medication adherence behavior: recommendations on optimal use. TranslBehav Med. 2015;5(4):470-82. doi: 10.1007/s13142-015-0315-2. https://doi.org/10.1007/s13142-015-0315-2