

The Achievement of IOP Target Among a Sample of Iraqi Patients with Glaucoma: A Retrospective Study

Duaa Raad Sadiq^{1,*}, Ehab Mudher Mikhael^{2,*}

¹Department of Clinical Pharmacy, University of Babylon, College of Pharmacy, Hillah, Iraq; ²Department of Clinical Pharmacy, University of Baghdad, College of Pharmacy, Baghdad, Iraq

*These authors contributed equally to this work

Correspondence: Ehab Mudher Mikhael, Email ihab.maddr@copharm.uobaghdad.edu.iq

Background: Glaucoma is a chronic progressive eye disorder. It is the primary cause of blindness. To prevent glaucomatous damage and blindness, the intra-ocular pressure (IOP) must be lowered to certain levels, this level is known as “IOP” target. Many studies conducted in developed countries have found that the majority of glaucoma patients failed to reach their target IOP.

Purpose: This study aimed to assess the achievement of IOP target among Iraqi patients with glaucoma and to determine the factors affecting it.

Patients and Methods: A single-center retrospective cohort study was conducted by inspecting the records of all patients with confirmed cases of glaucoma who were admitted to the Ibn-Al-Haitham Hospital outpatient unit from January 2020 to December 2022. To be included in the study, the patient must be newly diagnosed with glaucoma. In addition, full information on the patient’s demographics, medical therapy used, and IOP at baseline and after 1 month of treatment must be available in the patient’s case sheet. After considering the study inclusion criteria, the records of 760 patients were excluded, and only 100 patients were eligible.

Results: The included patients were mostly males, with an average age of 57.86 years. A 70% of the patients had elevated IOP in both eyes. Most patients (38%) were treated with two anti-glaucoma drugs. Only 35% of the patients achieved their targeted IOP. Regarding the factors influencing the achievement of the IOP target, all demographic data (age and gender) had a non-significant effect, while the number of prescribed drugs affected the ability of the patient to reach the IOP target.

Conclusion: Most of Iraqi glaucomatous patients do not achieve their IOP target. The number of prescribed eye drops can significantly affect the ability of glaucoma patients to reach their targeted IOP.

Keywords: IOP target, glaucoma, Iraq

Introduction

Glaucoma is a chronic progressive eye disorder associated with intraocular pressure-related damage to the optic nerve. Thus, it is considered the leading cause of blindness worldwide.¹⁻³ Major types of glaucoma are open angle and angle closure glaucoma. Both types may be primary (idiopathic) or secondary. Primary open angle glaucoma (POAG) is the most common type of glaucoma.^{4,5} Glaucoma is one of the ocular complications that is associated with diabetes mellitus; its prevalence is about 3% among diabetic patients.³ The prevalence of POAG in Middle East countries is 3.07%, which is higher than the global POAG prevalence (2.2%).^{6,7} In Iraq, the prevalence of glaucoma is even higher, approaching 3.6% in the southern province of Iraq, Thi-Qar.⁵ To prevent glaucoma-associated blindness, the intra-ocular pressure (IOP) must be reduced.^{1,8} Different treatment modalities, including laser therapy, surgery, and medication, can be used to lower IOP. Meanwhile, topical eye drops are the most common treatment option for most patients; thus, they are considered the cornerstone of glaucoma treatment.^{1,2} Although topical eye drops are preferred by most patients over other therapies, their use must be proper and persistent to ensure optimum benefits (ie, achieving the intended reduction

in IOP)⁹ and safety (ie, preventing eye infection by the use of contaminated eye drops).¹⁰ Only few studies were conducted among patients using anti-glaucoma eye drops to assess their achievement of target IOP (an IOP that assumed to prevent further glaucomatous damage without affecting a patient's quality of life)^{11–13} These studies found that the majority of patients failed to reach their IOP target.^{11,13} To the best of our knowledge no similar study was conducted in Iraq. Therefore, the current study aimed to assess the achievement of IOP target among Iraqi patients with glaucoma and to determine the factors affecting it.

Materials and Methods

Study Design and Participants

A single-center, retrospective cohort study was conducted at Ibn Al – Haytham Teaching Hospital, Baghdad, Iraq. On 2/5/2023, the records of all patients with confirmed case of glaucoma who were admitted to the hospital outpatient unit from January 2020 to December 2022 were inspected by the main author of this study.

A cohort of 860 participants with glaucoma was detected during this 3-year period. To be included in this study, the patient must be a newly diagnosed with glaucoma with an elevated IOP (>21 mmHg). In addition, full information on the patient's demographics, medical therapy used, and IOP at baseline and after 1 month of treatment must be available in the patient's case sheet. After considering the study inclusion criteria, the records of 760 patients were excluded, and only 100 patients were eligible.

All data were kept confidential, in accordance with the Declaration of Helsinki. This study was ethically approved by the ethics committee of the College of Pharmacy, University of Baghdad.

All data were fully anonymized before the author accessed them, and the ethics committee waived the requirement for informed consent. The patients did not provide informed written consent to have data from their medical records used in research.

Data Collection

Patient demographics, including age and gender, as well as the types of drugs prescribed, were collected in a specially designed format. In addition, IOP values at the time of initial diagnosis and one month after the use of medical therapy were documented for all included patients. The effect of medical therapy to achieve the IOP target was assessed in which a 30% reduction in IOP was considered as the expected target.¹⁴

Statistical Analysis

Data input and analyses were performed using Microsoft Excel 2010. Categorical variables are presented as numbers and frequencies, whereas continuous variables are presented as mean±standard deviation. Chi-square test was used to test the differences among categorical variables. Chi-square test was calculated using the online calculator "<http://www.quantpsy.org/chisq/chisq.htm>". P values less than 0.05 were considered significant.

Results

The included patients were mostly males, with an average age of 57.86 years. A 70% of the patients had elevated IOP in both eyes. Most patients (38%) were treated with two anti-glaucoma drugs, whereas four drugs were used for a minority of patients (11%). Only 35% of the patients reached their target IOP. Further details are provided in [Table 1](#).

Regarding the factors influencing the achievement of the IOP target, all demographic data (age and gender) had a non-significant effect, while the number of prescribed drugs affected the ability of the patient to reach the IOP target. In this regard, achievement of IOP target was highest among patients prescribed three drugs and lowest among those using one drug. Further details are provided in [Table 2](#).

Table 1 Demographic and Clinical Data of Study Participants

Parameter		Value
Age mean±SD		57.86±15.56
≤40 years		13
41–64 years		49
≥65 years		38
Gender	Males	56 (56%)
	Females	44 (44%)
Elevation of IOP	Both eyes	70 (70%)
	Left eye only	16 (16%)
	Right eye only	14 (14%)
No. of prescribed anti-glaucoma drugs to the patient	One drug	21 (21%)
	Two drugs	38 (38%)
	Three drugs	30 (30%)
	Four drugs	11 (11%)
	Mean±SD	2.31±0.93
Achievement of IOP target		35 (35%)

Abbreviation: SD, Standard deviation.

Table 2 Factors Influencing the Achievement of IOP Target

Parameter		IOP Target		P value
		Achieved	Not Achieved	
Gender	Male (n=56)	21 (37.5%)	35 (62.5%)	0.554
	Female (n=44)	14 (31.8%)	30 (68.2%)	
Age	Elderly* (n=38)	14 (36.8%)	24 (63.2%)	0.763
	Non-elderly (n=62)	21 (33.8%)	41 (66.2%)	
No. of drugs used	1 (n=21)	3 (14.2%)	18 (85.8%)	0.013
	2 (n=38)	11 (28.9%)	27 (71.1%)	
	3 (n=30)	17 (56.6%)	13 (43.4%)	
	4 (n=11)	4 (36.4%)	7 (63.6%)	

Note: *Elderly patients were defined as those aged ≥65 years.

Discussion

Most of the glaucoma patients enrolled in this study were elderly males. This finding was expected because glaucoma affects males more than females and its incidence increases with age.¹⁵ In this regard, the most notable cause of glaucoma in elderly (>50 years) is the eye lens enlargement.¹⁶ However, a low-cost screening technique is available now for early detection of such cases and cataract surgery could help in this regard, with or without microinvasive glaucoma surgery and thus no medication may be needed.¹⁷

The current study found that 70% of the patients had elevated IOP in both eyes. Similarly, Jeong et al found that 61% of the Korean patients with glaucoma had bilateral elevation of IOP.¹⁸ Meanwhile, this finding was highly expected since even in patients with asymmetric glaucoma, IOP may be elevated in both eyes.¹⁹

In contrast, the results of this study showed that most patients were treated with two or more anti-glaucoma drugs. This finding has also been reported by other studies.^{20,21} The use of multiple medications, either as fixed combinations or isolated medications, is justified to rapidly reach IOP targets.^{22,23}

However, the results of this study showed that only 35% of the patients reached their target IOP. These poor outcomes have also been observed in Indian patients.¹¹ In contrast, more than 50% of the patients in Egypt, an Arab developing country, achieved their target IOP.²⁴

This poor achievement of IOP target among the current sample of Iraqi glaucoma patients can be considered as an alarming bell for healthcare providers to find and solve the obstacles leading to this serious problem.

Regarding the factors influencing the achievement of IOP target among the current study participants, demographic factors (age and gender) were found to have a non-significant effect. The current finding was in contrast to that of Warjri et al who found that patients older than 40 years were better controlled on medication than younger patients.¹¹ This difference may be attributed to the small sample size, especially for the young patients included in the current study.

The results of the present study showed that the number of prescribed drugs affected the ability of the patients to reach the target IOP. This relationship was also found among Swedish patients in whom IOP target was achieved among 31% of patients using monotherapy for glaucoma and by 95% of patients using multi-drug therapy.¹³ Meanwhile, current study revealed an exception for this positive relationship between the number of antiglaucoma drugs and achievement of IOP target, in which only a few (11%) of patients using 4 drugs were able to achieve their IOP target. This exception was also detected among Egyptian glaucoma patients,²⁴ and it can be attributed mainly to poor patient adherence to complicated drug therapy regimens.^{11,13,22} Poor adherence owing to complicated drug regimens is common among Iraqi patients with different chronic diseases.^{25,26}

In addition absorption of topical eye medication may also be affected by central corneal thickness CCT, thicker cornea reducing medication absorption and vice versa.²⁷

Other possible unstudied reasons for the poor outcomes for the current study participants include inappropriate eye drop administration⁹ and use of low-quality products.^{28,29}

The results of this study are limited by the inclusion of records from only one hospital; however, this hospital is the largest ophthalmic hospital in Iraq. In addition, the retrospective nature of this study, lacking some important informations like central corneal thickness, specifying severity of glaucoma limit the ability to calculate target IOP accurately^{24,30} and to detect definite reasons behind the inability of most Iraqi glaucoma patients to achieve their target IOP after using anti-glaucoma eye drops. Whatever the reason for this poor outcome, patient education about the proper administration of eye drops,³¹ and the importance of adherence to prescribed therapy may help to solve this problem, at least partially. Therefore, pharmacist-led patient education about eye drops to newly diagnosed glaucoma patients is highly recommended. Moreover, further studies are needed, especially for taking into account the central corneal thickness and to investigate whether early surgery may help to achieve IOP target together with medication.

Conclusion

Most of Iraqi glaucomatous patients do not achieve their IOP target. The number of prescribed eye drops can significantly affect the ability of the glaucoma patients to reach their IOP target.

Acknowledgments

We would like to express our sincere gratitude to Dr. Ameer Marouf and the staff of Ibn Al-Haitham Teaching Hospital for providing the resources and facilities necessary for this research project. Finally, I would like to thank my family and friends for their unwavering support and encouragement throughout this journey.

Disclosure

The authors report no conflicts of interest in this work.

References

- Weinreb RN, Aung T, Medeiros FA. The pathophysiology and treatment of glaucoma: a review. *JAMA*. 2014;311(18):1901–1911. doi:10.1001/jama.2014.3192
- Martucci A, Nucci C, Pinazo-Duran MD. New perspectives in glaucoma pathophysiology, diagnosis, and treatment. *Front Med*. 2023;10:1200427. doi:10.3389/fmed.2023.1200427
- Mahdi H, El Abbadi N. Glaucoma diagnosis based on retinal fundus image: a review. *Iraqi J Sci*. 2022;4022–4046. doi:10.24996/ijsc.2022.63.9.32
- Harasymowycz P, Birt C, Gooi P, et al. Medical management of glaucoma in the 21st century from a Canadian perspective. *J Ophthalmol*. 2016;2016:1–22. doi:10.1155/2016/6509809
- Hussein HA, Bunian WS, Abd Saadon A. Epidemiology of ophthalmological disease in outpatient clinic In AL-Nasiriya during 2018. *Univ Thi-Qar J Med*. 2019;18(2):54–67.
- Allison K, Patel D, Alabi O. Epidemiology of glaucoma: the past, present, and predictions for the future. *Cureus*. 2020;12(11). doi:10.7759/cureus.11686
- Torabi R, Harris A, Siesky B, et al. Prevalence rates and risk factors for primary open angle glaucoma in the Middle East. *J Ophthalmic Vis Res*. 2021;16(4):644. doi:10.18502/jovr.v16i4.9755
- Abdulsahib WK, Al-Zubaidy A, Sahib HB, Kathem SH. Tolerable ocular hypotensive effect of topically applied sildenafil in ocular in normotensive and betamethasone-induced hypertensive rabbits. *Int J Pharm Sci Rev Res*. 2015;35(1):96–102.
- Atey TM, Shibeshi W, Giorgis TA, Asgedom SW. The impact of adherence and instillation proficiency of topical glaucoma medications on intraocular pressure. *J Ophthalmol*. 2017;2017:1–8. doi:10.1155/2017/1683430
- Razooki RA, Saeed EN, Al-Deem HIO. Microbial contamination of eye drops in out patient in Iraq. *Iraqi J Pharm Sci*. 2011;20:91–95.
- Warjri GB, Sidhu T, Kishan A, et al. Achieving low target intraocular pressures in severe glaucoma. *Eur J Ophthalmol*. 2021;31(6):3068–3073. doi:10.1177/1120672120979903
- Sihota R, Angmo D, Ramaswamy D, Dada T. Simplifying “target” intraocular pressure for different stages of primary open-angle glaucoma and primary angle-closure glaucoma. *Indian J Ophthalmol*. 2018;66(4):495. doi:10.4103/ijo.IJO_1130_17
- Lindén C, Hejil A, Jóhannesson G, Aspberg J, Andersson Geimer S, Bengtsson B. Initial intraocular pressure reduction by mono-versus multi-therapy in patients with open-angle glaucoma: results from the Glaucoma Intensive Treatment Study. *Acta Ophthalmol*. 2018;96(6):567–572. doi:10.1111/aos.13790
- DiPiro JT, DiPiro CV, Schwinghammer TL, Wells BG. *Pharmacotherapy Handbook*. McGraw-hill; 2015.
- Sun Y, Chen A, Zou M, et al. Time trends, associations and prevalence of blindness and vision loss due to glaucoma: an analysis of observational data from the global burden of disease study 2017. *BMJ Open*. 2022;12(1):e053805. doi:10.1136/bmjopen-2021-053805
- Laroche D, Capellan P. The aging lens and glaucoma in persons over 50: why early cataract surgery/refractive lensectomy and microinvasive trabecular bypass can prevent blindness and cure elevated eye pressure. *J Natl Med Asso*. 2021;113(4):471–473. doi:10.1016/j.jnma.2021.03.001
- Laroche D, Rickford K, Mike EV, et al. A novel, low-cost glaucoma calculator to identify glaucoma patients and stratify management. *J Ophthalmol*. 2022;2022(1):5288726. doi:10.1155/2022/5288726
- Jeong D, Sung KR, Na JH. Comparison of clinical characteristics and progression rates of bilaterally and unilaterally progressing glaucoma. *Korean j Ophthalmol*. 2015;29(1):40–46. doi:10.3341/kjo.2015.29.1.40
- Al-Yaqubi ON, Momjian RLB, Bader MM. the value of color Doppler imaging in patients with primary open angle asymmetric glaucoma. *J Fac Med Baghdad*. 2005;47(4).
- Yu L, Ding K, Luo L, Yu Z. Prescribing trends of glaucoma drugs in six major cities of China from 2013 to 2017. *PLoS One*. 2020;15(1):e0227595.
- Hosoda M, Yamabayashi S, Furuta M, Tsukahara S. Do glaucoma patients use eye drops correctly? *J Glaucoma*. 1995;4(3):202–206. doi:10.1097/00061198-199506000-00011
- Covert D, Robin AL. Adjunctive glaucoma therapy use associated with travoprost, bimatoprost, and latanoprost. *Curr Med Res Opin*. 2006;22(5):971–976. doi:10.1185/030079906X104777
- Movahedinejad T, Adib-Hajbaghery M. Adherence to treatment in patients with open-angle glaucoma and its related factors. *Electron Physician*. 2016;8(9):2954. doi:10.19082/2954
- Saif AT, Saif P. Achieving Target IOP. *Glokom-Katarakt*. 2017;12(1):60–69.
- Al-Ganmi AHA, Alotaibi A, Gholizadeh L, Perry L. Medication adherence and predictive factors in patients with cardiovascular disease: a cross-sectional study. *Nurs Health Sci*. 2020;22(2):454–463. doi:10.1111/nhs.12681
- Al-Tuma A, Jassim NA. Adherence to methotrexate in Iraqi patients with rheumatoid arthritis: a cross-sectional study. *Glob J Public Health Med*. 2022;4(1):618–630.
- Johnson TV, Toris CB, Fan S, Camras CB. Effects of central corneal thickness on the efficacy of topical ocular hypotensive medications. *J Glaucoma*. 2008;17(2):89–99. PMID: 18344753. doi:10.1097/IJG.0b013e31814b9938
- Vida RG, Merczel S, Jahn E, Fittler A. Developing a framework regarding a complex risk based methodology in the evaluation of hazards associated with medicinal products sourced via the internet. *Saudi Pharm J*. 2020;28(12):1733–1742. doi:10.1016/j.jsps.2020.10.018
- Al-Jumaili AA, Younus MM, Saleh MZ. The epidemic of substandard and falsified medications in Iraq: evaluating the effectiveness of national pharmacovigilance alerts to community pharmacies. *Pharmaceut Med*. 2021;35(3):169–186. doi:10.1007/s40290-021-00386-9
- Traverso CE. Practical points on the target IOP, *Glaucoma World No. 19*; 2000.
- Salh HJH, Hussein TA, Aziz TA. Highlighting the Issues associated with glaucoma medication therapy: a pharmaceutical care evaluation. *Al-Rafidain J Med Sci*. 2023;5:57–66. doi:10.54133/ajms.v5i.149

Clinical Ophthalmology

Dovepress

Publish your work in this journal

Clinical Ophthalmology is an international, peer-reviewed journal covering all subspecialties within ophthalmology. Key topics include: Optometry; Visual science; Pharmacology and drug therapy in eye diseases; Basic Sciences; Primary and Secondary eye care; Patient Safety and Quality of Care Improvements. This journal is indexed on PubMed Central and CAS, and is the official journal of The Society of Clinical Ophthalmology (SCO). The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/clinical-ophthalmology-journal>