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Research Article

Factors that Influence Intraocular Pressure Target in a Sample of Iraqi Patients Using Antiglaucoma Medications: A Cross-Sectional Study

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Abstract

Background: Anti-glaucoma eye drops are mainly used to lower intraocular pressure (IOP) and manage glaucoma. Many studies found that achievement of the IOP target is poor. ***Objective***: This study aimed to assess the achievement of the IOP target and factors affecting it among a sample of Iraqi patients with glaucoma. ***Methods***: A single-center, cross-sectional study was conducted on patients with glaucoma from December 2023 to April 2024 at Ibn Al-Haytham Hospital, Baghdad, Iraq. All patients who received medical therapy for at least one month were eligible to participate in this study. Intraocular pressure values at the time of initial diagnosis and at the time of enrolment in the study were documented for all included patients. Medication adherence was measured by the Arabic version of the Morisky medication adherence scale-4. Eye drop administration technique was assessed through direct observation by the researcher using a newly developed and validated checklist. ***Results***: Most participants in the current study were males with primary education. The average disease duration was 14 months. The target IOP was achieved among 36% of participants. The adherence to eye drops was good in 55% of participants. Only 9% of participants administered eye drops with a good technique. Achievement of the IOP target was significantly influenced by good adherence and technique for administration of eye drops (p<0.05). ***Conclusions***: IOP-target achievement is poor among Iraqi patients. Adherence to and administration technique of eye drops are significant factors that could affect IOP-target achievement.

Keywords: Adherence, Glaucoma, Iraqi patients, Intraocular pressure, Treatment target.

العوامل المؤثرة على ضغط العين المستهدف في عينة من المرضى العراقيين الذين يستخدمون أدوية مضادة للجلوكوما: دراسة مقطعية

الخلاصة

الخلفية: تستخدم قطرات العين المضادة للجلوكوما بشكل أساسي لخفض ضغط العين (IOP) والسيطرة على المرض. وجدت العديد من الدراسات أن تحقيق هدف IOP ضعيف. **الهدف**: تهدف هذه الدراسة الى تقييم مدى تحقيق هدف IOP والعوامل المؤثرة عليه لدى عينة من المرضى العراقيين الذين يعانون من الجلوكوما. **الطريقة**: أجريت دراسة مقطعية أحادية المركز على مرضى الجلوكوما من ديسمبر 2023 إلى أبريل 2024 في مستشفى ابن الهيثم، بغداد، العراق. جميع المرضى الذين تلقوا العلاج الطبي لمدة شهر واحد على الأقل كانوا مؤهلين للمشاركة في هذه الدراسة. تم توثيق قيم ضغط العين في وقت التشخيص الأولي وفي وقت التسجيل في الدراسة لجميع المرضى المشمولين. تم قياس الالتزام بالدواء من خلال النسخة العربية من مقياس الالتزام بالأدوية Morisky-4 تم تقييم تقنية استخدام قطرة العين من خلال الملاحظة المباشرة من قبل الباحث باستخدام قائمة مرجعية تم تطويرها والتحقق من صحتها حديثا. **النتائج**: كان معظم المشاركين في الدراسة الحالية من الذكور الحاصلين على تعليم ابتدائي. كان متوسط مدة المرض 14 شهرا. تم تحقيق IOP المستهدف بين 36% من المشاركين. كان الالتزام بقطرات العين جيدا لدى 55% من المشاركين. 9٪ فقط من المشاركين استخدموا قطرات العين بتقنية جيدة. تأثر تحقيق هدف IOP بشكل كبير بالالتزام الجيد وتقنية إعطاء قطرات العين. **الاستنتاجات**: الإنجاز المستهدف ل IOP ضعيف بين المرضى العراقيين. يعد الالتزام بقطرات العين وتقنية استخدامها من العوامل المهمة التي يمكن أن تؤثر على تحقيق هدفIOP .

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INTRODUCTION

Glaucoma is a common eye disease with a prevalence of 2.2% worldwide. Meanwhile, its prevalence is higher in Iraq and other Middle East countries [1,2]. On a pathophysiological basis, glaucoma can be classified into open-angle glaucoma and angle closure glaucoma, which can be either primary or secondary [1]. Being the second cause of avoidable blindness in the world, glaucoma is a serious health problem [3]. Leaving glaucoma without treatment or even treatment inadequately can result in optic nerve damage and visual impairment [4,5]. The only way to minimize optic nerve damage and visual impairment for patients with glaucoma is by lowering the intra-ocular pressure (IOP) to a certain level; this level is called the IOP target [6]. To reduce IOP, glaucoma must be managed either

pharmacologically or by non-pharmacological means (by surgery and laser); however, eye drops are the most commonly used and preferred therapy for glaucoma [4,5,7]. Studies conducted in developing countries such as Egypt, Ethiopia, India, and Pakistan found that achievement of the IOP target is poor among glaucoma patients [8–11]. There are many factors that affect the achievement of the IOP target, including age, baseline IOP level, type and severity of glaucoma, number of drugs, medical and surgical history, socioeconomic factors, and environmental factors [6,9,12]. However, adherence to the use of eye drops and the good technique for their administration are the most important factors [9,13,14]. To the best of our knowledge, no studies were conducted in Iraq to assess the proportion of glaucoma patients who reach their IOP target and the factors that influence the achievement of this target. Therefore, the current study aimed to assess the achievement of the IOP target and factors affecting the achievement of the IOP target among a sample of Iraqi patients with glaucoma.

METHODS

Study design and participants

From December 2023 to April 2024, a single-center, cross-sectional study was done on a convenient sample of patients with open angle glaucoma at Ibn Al-Haytham Teaching Hospital in Baghdad, Iraq. The College of Pharmacy, University of Baghdad's ethical committee approved the study (approval no. RECAUBCP8102023K on August 10, 2023). The study's planned sample size was 100 participants [15]. All recruited participants were adults (aged 18-80 years) who were outpatients with a previous diagnosis of open angle glaucoma and had been on anti-glaucoma therapy for at least one month prior to participation. Patients who did not know their IOP level at baseline before initiating medicinal therapy were excluded from the trial. In addition, all patients with psychiatric problems and other ophthalmological abnormalities except glaucoma were excluded. All eligible patients were acknowledged about the study's aims, and only those who granted verbal informed consent were included.

Data collection

Patient data, such as age, gender, educational level, and monthly income, as well as the length of glaucoma and the types of medicines prescribed to the patient, were obtained during an interview with each participant. Furthermore, IOP values at the time of first diagnosis (obtained from patient records) and at time of enrollment in the trial (estimated by an ophthalmologist) were recorded for all enrolled patients. The effectiveness of medicinal therapy in achieving the IOP target was evaluated using the percentage of IOP reduction. The drop in IOP is usually between 20 and 50% of the baseline level, depending on the stage of the disease. However, a 30% reduction was considered as a reasonable reduction for most patients [16], thus this was chosen as a target in the present study. For patients with glaucoma in both eyes, lowering IOP to the desired level in one eye was deemed half success. Medication adherence was assessed using the Arabic version of the Morisky medication adherence scale-4 [17]. The researcher analyzed the patient's approach to administering eye drops by directly seeing his or her use of the drops. Patients were instructed to place a drop in their eyes using a single-use natural tear eye drop [18]. Meanwhile, patients who already had their eye drops were asked to utilize them when it was time for treatment. Data gathered during the assessment were immediately entered into a newly developed checklist based on previous literature [17,19-21]. A team of three clinical pharmacy professionals reviewed and validated this checklist. Because some patients used a single eye drop formula for treatment while others used multiple drop formulas, the accuracy of the eye drop administration technique was calculated as a percentage; this was accomplished by dividing the number of correct steps taken by the patient by the total number of steps required for the best eye drop administration technique. Patients who administered eye drops with an accuracy of 80% or higher were regarded to have good administration technique; those with an accuracy of 60-80% were termed moderate, and those with an accuracy of less than 60% were labeled bad [22].

Statistical analysis

Data input and analysis were done using SPSS (Statistical Package for Social Science) version 16. Categorical variables were presented as numbers and frequencies. Continuous variables were presented as mean±standard deviation. Binary logistic regression was used to assess the significance of factors affecting the achievement of the IOP target. For statistical purposes, the educational level of study participants was converted to numbers starting from 1 for illiterate participants to 7 for postgraduate participants. A Pearson correlation test was used to test the level of correlation among different continuous variables. P values less than 0.05 were considered significant.

RESULTS

Most participating patients in the current study were males (61%) with a primary level of education (38%) and an average monthly income of 500000-750000 ID. The average age of study participants was 59.25±12.07 years. Further details are shown in Table 1. Regarding clinical parameters of study participants, the average duration of glaucoma was 13.76±14.02 months. More than half of participants were using two eye drops for treatment of glaucoma. The adherence to eye drops was good by 55% of participants. Only 9% of study participants administered eye drops with a good technique. Meanwhile, only 8% of participating patients

received education about the usage of their eye drops.

Table 1: Socio-demographic data of study participants

Parameter		Value
Age (year)		59.25±12.07
Gender	Male	61(61)
	Female	39(39)
Education	Illiterate	14(14)
	Primary	38(38)
	Intermediate	16(16)
	Secondary	8(8)
	Diploma	7(7)
	Bachelor	14(14)
	Postgraduate	3(3)
Income/month	< 500000 ID	10(10)
	500000-750000 ID	58(58)
	> 750000 ID	32(32)

Values were expressed as frequency, percentage, and mean±SD.

All patients received their education from their physician. The target IOP was achieved among 36% of study participants. Further details are shown in Table 2.

Table 2: Clinical parameters of study participants

Parameter		Value
Duration of glaucoma (months)		13.76±14.02
No. of eye drops used	1	35
	2	53
	3	12
Type of eye drops used*	Timolol	40
	Latanoprost	34
	Dorzolamide	28
	Dorzolamide+Timolol	39
	Others	36
Medication adherence	Good	55
	Moderate	31
	Poor	14
Accuracy of eye drop administration technique (%)	mean±SD	54.05±14.7
	Good (80-100)	9
	Moderate (60-79)	32
	Poor (< 60)	59
IOP target	Fully achieved	36
	Partially achieved	20
	Not achieved	44
Received education about eye drop administration technique	Yes	8
	No	92

*The total number of eye drops used is greater than 100 since each participant may be prescribed more than one eye drop.

Table 3 shows that medication adherence (p= 0.002) and eye drop administration technique (p= 0.016) were the only factors that affect the achievement of the IOP target.

Table 3: Factors affecting the achievement of IOP target

Parameter	Odd ratio	*p*-value
Medication adherence	2.485	0.002
Accuracy of eye drop administration technique	1.046	0.016
No. of drugs used	0.772	0.495
Age (year)	1.03	0.186
Education level	0.959	0.762
Duration of glaucoma	0.968	0.126

Table 4 shows that medication adherence can be positively correlated with a good technique for administering eye drops (p= 0.000) and by the patient's monthly income (p= 0.026).

Table 4: Factors affecting medication adherence

Parameter	Correlation coefficient	*p*-value
Age	-0.085	0.401
Duration of glaucoma	0.008	0.941
Eye drop administration technique	0.354	0.000
Monthly income	0.223	0.026
Educational level	0.140	0.164
No. of drops used	0.041	0.683

Meanwhile, all other demographic and clinical factors were not significantly affecting patient adherence to eye drops. On the other hand, none of the studied demographic and clinical parameters were significantly correlated with the accuracy of eye drop administration (Table 5).

Table 5: Factors affecting accuracy of eye drop administration

Parameter	Correlation coefficient	*p*-value
Age	-0.076	0.452
Duration of glaucoma	-0.016	0.876
Receiving education about eye drop administration	0.070	0.491
Educational level	0.165	0.100
No. of drops used	0.022	0.829

DISCUSSION

The gold standard for glaucoma treatment is to stop or delay the progression of the disease while minimizing optic nerve damage. These goals are met by reducing IOP levels. The current study found that only 36% of glaucoma patients met their IOP objective. This result was quite similar to that obtained in a recent retrospective analysis of glaucoma patients at Ibn Al-Haitham Teaching Hospital in Baghdad, Iraq [23]. Meanwhile, this percentage was extremely low when compared to patients in other developing nations, where roughly 60% of glaucomatous patients met their IOP target in Egypt and Ethiopia [8,9]. According to the research, the primary reasons for failing to meet the IOP target are poor adherence to eye drops and poor technique while administering eye drops [9,19,24-26]. Meanwhile, these causes were found to have a considerable impact on the current study participants' ability to meet the IOP target. Furthermore, the majority of patients in the current study had low adherence to the treatment and poor administration technique of eye drops. Poor adherence to treatment and inappropriate medication administration result in treatment failure, deterioration of the patient's condition, and rapid visual impairment [19,24,25]. The current study found that only 55% of patients had good adherence to the administration of eye drops. This adherence rate was significantly lower than that of glaucoma patients in Jordan but higher than that in Egypt and Oman [27-29]. Despite these minor discrepancies in adherence, which are primarily attributable to differences in sample size between the aforementioned studies, it appears that adherence to eye drops is low among Arab patients. The current study's findings revealed a strong correlation between medication adherence and a good technique for administrating eye drops. This conclusion was similar to previous research

conducted on Ethiopian and Canadian patients [9,30]. Meanwhile, such a result is expected since side effects is one of the important factors that contribute to poor adherence [25,31]. However, good techniques for administering eye drops can reduce side effects, and thus may enhance patient adherence to eye drops [32]. On the other hand, the current study found that a patient's monthly income can have a positive effect on drug adherence. This figure is reasonably plausible given that more than 20% of Iraq's population lives below the poverty level [33]. When the free supply of pharmaceuticals in public hospitals is interrupted, such impoverished people cannot afford to purchase them from private pharmacies [34,35]. The current study found that only 9% of study participants used a good approach for administering eye drops. This outcome is somewhat disappointing and far lower than that observed among Brazilian patients, where 28% were able to correctly apply eye drops [36]. The current study participants' poor eye drop administration technique could be linked to the fact that only 8% of participating patients were educated on how to use their eye drops. In this regard, the study's findings revealed that all patients who received education on the proper use of their eye drops did so from their ophthalmologist, not a pharmacist. This finding raises concerns regarding the function of pharmacists in Iraqi hospitals, necessitating an immediate examination of pharmacist roles to determine the root cause of the problem. Meanwhile, pharmacists can play an important role by cooperating with physicians to educate patients, which can lead to better outcomes [19,37].

Study limitations

The small sample size and single-hospital setting of the current study presented limitations. In addition, the assessment of medication adherence involved direct patient interviews, which could potentially yield a falsely positive result due to the social desirability of the patients during the interviews [38].

Conclusion

Iraqi patients perform poorly in terms of meeting the IOP target. Adherence to and method for administering eye drops are important elements that can influence IOP target achievement.

Conflict of interests

No conflict of interests was declared by the authors.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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