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Glaucoma in Seniors- Therapeutic Decisions

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Abstract:- Glaucoma is irreversible progressive optic neuropathy, for which the major proven treatment is to lower the intraocular pressure. Our study aims to present therapeutic decisions, used to treat glaucoma among the citizens of Sofia city aged 65 years and above. Data were collected in a prophylactic ophthalmic campaign, realized in the summer of 2016 and 2017, in Sofia city. All patients passed thorough ophthalmic examinations and filled pen-and-paper questionnaires. The predominant number of persons with glaucoma was treated with conservative monotherapy. Prostaglandin analogues have been prescribed to more than half of the patients. Fixed combinations have been used in 86% of the cases who needed combined therapy with two substances and in 100% of those with three medications. The therapeutic scheme used for treating glaucoma in seniors in Sofia city is similar and corresponding to practice worldwide. Conservative monotherapy is used in a mean of 45%. When combined therapy is necessary, fixed combinations are predominantly prescribed to minimize adverse events and to ensure better patients compliance. A tendency of usage of preservative-free formulas to benefit patients' eye health has been noticed.

Keywords:- *Glaucoma, Seniors, Therapy, Fixed Combination, Medication.*

Abbreviations and Acronyms
POSE = prophylactic ophthalmic screening among elderly people, PEX= pseudoexfoliative syndrome, PGAs = Prostaglandin analogues, CAIs= Carbonic Anhydrase Inhibitors

I. INTRODUCTION

Glaucoma is generally asymptomatic irreversible progressive optic neuropathy, whose prevalence increases with age and reaches 10% over 75 years [**1-3**]. Major predisposing factors are elevated IOP, age, sex, pseudoexfoliations, myopia, diabetes, and a family history of glaucoma [**4**]. Medical and surgical treatments are aimed at decreasing intraocular pressure by decreasing the production of aqueous humor and increasing its outflow [**5**]. Six groups of local and systemic medications are used to lower IOP [**6**]. Topical anti-glaucoma drops are predominantly applied [**7**]. Among them, prostaglandin analogues (PGAs) are presenting the highest IOP reduction, followed by β-blockers, and they are licensed for first and second-line use [**3, 8**]. Conservative therapy with a single medication is preferred if it could ensure good control of the disease [**9**]. When monotherapy is insufficiently effective, the alternatives include changing medication, the addition of an extra drug, performing laser or surgery [**10, 11**]. For the reason that patients' concordance and drop instillation techniques are of great importance for the result of the treatment, fixed combination drugs are preferred by the ophthalmologists because they ensure better patient adherence with a simple dosing regimen and less exposure to preservatives when multiple medications have to be applied [**4, 12**]. Laser treatment is used in 10% of the cases to ensure pressure control without local medication, in addition to the current therapy, and in the cases with closed-angle glaucoma. Surgery has to be performed when medications and laser treatment are insufficiently effective or in advanced glaucoma at diagnosis [**13**].

II. METHODS

The study population included the citizens of Sofia city aged 65 and above, who were enrolled for analysis after entering a screening program organized by the Ophthalmology Department of Alexandrovska University Hospital in Sofia, Bulgaria.

An announcement for prophylactic ophthalmic examinations of elderly Sofia citizens, over the age of 65, was transmitted through mass media in two consequent years (2016 and 2017), for 3 weeks during summer. The study was named Prophylactic ophthalmic screening among the elderly (POSE).

All persons passed a thorough ophthalmic examination, including visual acuity test, slit-lamp biomicroscopy, intraocular pressure measurement, fundoscopy using stereoscopic slit-lamp biomicroscopy with 90D fundus lens. The attendants filled paper-and-pen questionnaires about their current complaints and therapy, usage of correction glasses and refraction, diagnosed systemic and ocular diseases, family, and medical history. These data revealed tendencies

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in anti-glaucoma treatment, used by the ophthalmologists in Sofia.

Statistical methods

A descriptive statistic was applied. Qualitative variables were presented as numbers and percentages, numerical variables were represented as the median and interquartile range (both 25 and 75 percentile). The relation between numerical variables was checked by Spearman's rho correlation coefficient.

III. RESULTS

800 individuals from the general population responded to the invitation for prophylactic ophthalmic examinations.

708 of them, (1415 eyes) were persons aged 65 years and older but not evenly distributed by age. The biggest number of participants (n=200), 28%, were aged 65 to 69. Only 69 of the attendants, (9.7%) were over 85 years (**Fig. 1**).

Fig. 1 Distribution of participants by age in POSE study

A fifth of the attendants (n=142, 20.3%) have had at least one of these characteristics: elevated IOP over 21 mmHg, narrow anterior ocular chamber, Cup/ disk ratio over 0,5 or inequality of C/ D ratios of both eyes over 0.2, a glaucomatous look of the optic nerve head and pseudoexfoliative syndrome. A thorough ophthalmic examination was recommended to them. Of all 708 persons, 23 have had a narrow anterior chamber angle and 66 have had a pseudoexfoliative syndrome, with prevalence increasing with age.

A thorough ophthalmic examination was offered to 28 persons who were strongly suspected to have glaucoma because of the presence of more than two clinical signs of the disease. 15 of them and have passed a thorough ophthalmic examination for glaucoma including visual acuity with correction, measurements of central corneal thickness, and visual field, diurnal IOP curve (using Goldmann applanation tonometry), gonioscopy, slit-lamp biomicroscopy, funduscopy, and optical coherence tomography. 10 of those patients were diagnosed with glaucoma and started treatment. Monotherapy with a prostaglandin analogue (PGA) was prescribed to four patients (40%), three received β-blockers, and one patient received CAI. Combined therapy was prescribed to two persons (20%) because of the insufficient effect of monotherapy. Both patients received β-blocker plus PGA, one in a fixed combination, and the other separated, in two containers.

14% of all participants (99 patients) with a median age of 75 years (IQR 70-80) have been previously diagnosed with glaucoma. Less than half of them, 43% (n=43), were males. 7% of them (n=7) have had secondary glaucoma (neovascular, traumatic, inflammatory); 14% (n=14) have had pseudoexfoliative glaucoma; 4% (n=4) have had closed-angle glaucoma; 10% (n=10) have had glaucoma surgery procedures; laser treatment has been previously performed in 9 persons (9%).

Among patients, previously diagnosed with glaucoma, a predominant number, of almost 68% were using PGAs, 55% were taking β-blockers in mono- or combined therapy. 19% did not receive therapy at the moment, because they have already gone through different kinds of surgical procedures, including laser treatment (**Tab. I**).

TABLE I

Distribution of the usage of different groups of medications in mono- or combined anti- glaucoma therapies	
Group of medication	**Percent, %**
PGAs	68%
β-Blockers	55%
CAIs	24%
α-$_2$ agonists	9%
No conservative therapy	19%

Monotherapy was predominantly used for treating 43% of the patients. 22% of the participants in POSE needed combined therapy with two substances. The higher number of used substances correlated to lower prevalence (**Tab. II**).

TABLE II

Analysis of the number of medications used to treat glaucoma	
Number of medications	**Percent, %**
Monotherapy	43%
Two medications	22%
Three medications	10%
Four medications	5%

A thorough look at the number of containers of eye drops, irrespective of the number of active substances, used from the patients with glaucoma, revealed that the predominant number of persons (64%) were using a single-container therapy and 14% were using two bottles of eye drops (**Tab. III**).

TABLE III

Number of containers of eye drops used by the patients	
Number of containers	**Percent, %**
Single container	63%
Two containers	15%
Three containers	3%

Anti-glaucoma therapy in one container was used by 78%. It could be concluded that at least one fixed combination is used when the number of active substances exceeds the number of containers of eye drops. Fixed combinations were prescribed to 86% of the patients who needed two medications therapy and in 100% of the cases with triple therapy. In cases that needed three or more medications to control the IOP, at least one fixed combination was prescribed (**Tab. IV**).

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TABLE IV

Correlation between the number of active substances and the number of containers of eye drops			
Number of medications	**Number of containers**		
	1	2	3
Monotherapy	100%	0%	0%
Two medications	86%	14%	0%
Three medications	0%	100%	0%
Four medications	0%	40%	60%
Total	78%	19%	4%

The analysis of different groups of medications that were used to control glaucoma among the participants in POSE revealed that β-blockers monotherapy was applied in thirty percent, but in 70% they were included in combined therapy. Monotherapy with PGAs was registered in 44% but in 56%, PGAs were used in combined therapy. CAIs were prescribed in only 4% as monotherapy whilst in 96% they were included in poly-drug therapy. We found the usage of α-$_2$ agonists in 56% of the cases with combined therapy of four drugs. Thus it could be concluded that Bulgarian ophthalmologists have generally prescribed α-$_2$ agonists as the last option for conservative treatment (**Tab. V**).

TABLE V

Usage of different groups of anti-glaucoma medications in mono and combined therapies				
Group of medication	**Number of drugs used**			
	1	2	3	4
No β- blockers	31%	3%	0%	0%
β- blockers	30%	41%	20%	9%
No PGAs	21%	8%	0%	0%
PGAs	44%	30%	18%	8%
No CAIs	36%	14%	1%	0%
CAIs	4%	33%	42%	21%
No α-$_2$ agonists	32%	17%	7%	0%
α-$_2$ agonists	11%	22%	11%	56%

Lots of patients were switched to therapy with preservative-free formulas either as monotherapy or in a fixed combination of eye drops to diminish adverse events of chronic exposition to preservatives in continuous glaucoma treatment with different classes of drugs.

The relation between the age and the number of containers was checked and a very strong correlation was proved (Spearman's rho= 0.891, p=0.014).

The analysis of anti-glaucoma therapy by age revealed that PGAs were the predominantly used medications, followed by β-blockers. The biggest prevalence of conservative local treatment was in the group 75-79 years old, in which PGAs were used in almost 49% and β-blockers in 43%. In all the other age groups, the prevalence of the same medication classes was lower. Monotherapy was prescribed mostly in the group 65-69 years old and its usage was diminishing with age, while the need for combined therapies was increasing with increasing age. The highest level of usage of combined therapy was found in the group 75-79 years old.

IV. DISCUSSION

Sight-threatening disorders, such as glaucoma are more often found among the elderly population, the risk for the disease increases with age (by 26% per decade). Meanwhile, this group of the society has had many difficulties in receiving access to ophthalmic consultation like lots of comorbidities, problems with movement, low incomes, diminishing mental capacity, etc. These findings make elderly people a target group for preventive programs and investigations to estimate morbidity and analyze treatment. Screenings are cheap and easy to organize but they have a great impact not only on the life of every person who was diagnosed and received a chance to keep his vision but also on society, by diminishing the number of blind or visually impaired persons [**14**]. All these facts forced our team to organize a screening program to estimate the prevalence of glaucoma and its treatment, to ensure easy access to medical help for this group of the society, and to analyze tendencies in morbidity and treatment.

The POSE study could be considered as representing a sample of "the third age" of Sofia, because of the great number of attendants aged 65 years and above. Our findings revealed that 5% of the elderly population of Sofia city has suspected glaucoma. The newly diagnosed persons with glaucoma were 1.5% and 11% have had previously diagnosed glaucoma. The current anti-glaucoma therapies of the participants, examined in POSE emphasized some points to consider:

According to the data presented above, conservative treatment was used in most cases, with a predominance of monotherapy with PGAs, followed by β-blockers which is in concordance with the recommendations of EGS for first-line therapy and those used in many other countries [**7, 15-17**]. Preservative-free formulations were preferred, especially in cases with ocular surface disease or allergy. When combined therapy was necessary, fixed combination eye drops were chosen because of lower exposure to preservatives and to ensure better patient compliance and adherence [**6, 8, 10, 12**]. The majority of the patients were using single-container therapy. Laser treatment had been applied in cases with allergy, intolerance, poor compliance, angle-closure glaucoma, pupillary block, or when target IOP could not be reached with conservative therapy [**1**, **3, 9, 13**]. The rising number of persons who use preservative-free eye drops and the tendency for more patients to be switched to those formulations, improve their compliance and the state of the anterior ocular surface.

V. CONCLUSIONS

The therapeutic scheme used for treating glaucoma, ocular hypertension, and glaucoma suspected in ambulant and hospital practice in Bulgaria, strongly corresponds to practice worldwide and the guidelines published by many professional ophthalmology organizations and institutions [**7, 9, 10, 15-17**]

The great number of persons suspected to have glaucoma (5% of all attendants in the POSE study) and 10 newly diagnosed patients (1.5% of the whole group or 36% of the persons suspected to have glaucoma or 67% of the patients with suspected glaucoma who were examined in Alexandrovska university hospital), who started treatment, emphasized the need for regular prophylactic examinations of the elderly part of the society.

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