Clinical and epidemiological study in patients with primary open-angle glaucoma

Estudo clínico-epidemiológico em indivíduos com glaucoma primário de ângulo aberto

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Abstract

Objective: *To evaluate the clinical and epidemiological profile of patients with primary open-angle glaucoma.* ***Methods:*** *This is a quantitative study with cross-sectional and analytical design, which sample consisted of 425 patients treated in an unit of Specialized Care in Ophthalmology, located in the northern state of Minas Gerais, from 2004 to 2015. We collected the data using formularies that addressed demographic and clinical aspects, risk factors and the presence of undercurrent diseases. We conducted an ophthalmological examination to evaluate anatomical and functional changes. We used statistical analysis, and the results are presented by mean, standard deviation and percentiles 25, 50 and 75.* ***Results:*** *Females predominate (56.8%), the age group of 60 years or older (44%) and mixed skin (81.7%). A minority of participants present risk factors such as high myopia (6.3%) and diabetes mellitus (17.9%). Regarding the clinical examination, there is a prevalence of increased optic nerve excavation (≥ 0.8) and low thickness of the corneas (≤ 535 microns).* ***Conclusion:*** *Most people develop advanced glaucoma, with increased optic nerve excavation and changed visual fields. Other common risk factors are: family history of glaucoma, decreased thickness of the cornea and hypertension. Early diagnosis and treatment can prevent vision loss. Primary care physicians should consider referring patients who have glaucoma risk factors, for an ophthalmologic examination.*

Keywords: *Glaucoma primary open-angle/diagnosis; Glaucoma primary open-angle /epidemiology; Blindness; Eye health*

Resumo

Objetivo: Avaliar o perfil clínico-epidemiológico dos indivíduos com glaucoma primário de ângulo aberto. **Métodos:** Trata-se de estudo quantitativo com desenho transversal e analítico, mediante amostra constituída de 425 pacientes atendidos em uma Unidade de Atenção Especializada em Oftalmologia localizada no norte do estado de Minas Gerais, Brasil, cadastrados no período de 2004 a 2015. As variáveis analisadas foram: características demográficas e clínicas, fatores de risco e presença de doenças associadas. Foi realizado exame oftalmológico para avaliar alterações anatômicas e funcionais. Para as análises estatísticas foram utilizados os programas Statistical Package for the Social Sciences (SPSS), versão 19.0. Considerou-se nível de significância p<0,05 para as variáveis categóricas. As variáveis descritivas foram apresentadas pela média, desvio-padrão e percentis 25, 50 e 75. **Resultados:** Predominou o gênero feminino (56,8%), a faixa etária de 60 anos ou mais (44%), e a cor da pele parda (81,7%). Fatores de risco como alta miopia (6,3%) e diabetes mellitus (17,9%) foram relatados pela minoria dos participantes. Em relação ao exame clínico, houve prevalência de escavação do nervo óptico aumentada (≥ 0,8 mm2) e baixa espessura central das córneas (≤ 535 micras). **Conclusão:** A maioria dos indivíduos apresenta glaucoma avançado, com escavações do nervo óptico aumentadas e campos visuais alterados. Outros fatores de risco frequentes foram: história familiar positiva para glaucoma, espessura central da córnea diminuída e hipertensão arterial sistêmica. Diagnóstico e tratamento precoces podem prevenir contra a perda de visão no glaucoma. Médicos da atenção primária à saúde devem encaminhar os pacientes que tenham fatores de risco para glaucoma, para a consulta especializada e exames oftalmológicos.

Descritores: Glaucoma de ângulo aberto/diagnóstico; Glaucoma de ângulo aberto/epidemiologia; Cegueira; Saúde ocular

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The authors declare no conflict of interests.
Received for publication 21/02/2017 - Accepted for publication 09/11/2017.

Introduction

Glaucoma is considered a public health problem, being the main cause of irreversible blindness in the world.[1] In 2013, the number of people with glaucoma in the world was estimated at 64.3 million, and is expected to increase to 76 million by 2020 and 111,8 million by 2040.[2] In Brazil, the Brazilian Council of Ophthalmology estimates that there are 985.000 people with glaucoma over the age of 40.[3]

Primary open angle glaucoma (POAG) is an optic neuropathy with a slow evolution, usually bilateral and often asymmetrical. It only occurs in adults with open angles of the anterior chamber and absence of other eye diseases that lead to changes in the optic nerve.[4]

Literature describes several risk factors for POAG[3]: increased intraocular pressure (IOP),[5] age (over 60 years old),[6] gender,[7] black ethnicity,[7] high myopia,[6,8] family history of glaucoma,[9] central thickness of the cornea decreased (ECC),[10] hypertension (SAH), [8] diabetes mellitus (DM),[11] migraine[5] and sleep apnea.[5] Increased IOP is a major risk factor for glaucoma, and the only one that can be measured with the possibility of intervention.[12]

Because of the lack of data related to the glaucomatous population in the north of Minas Gerais, studies in this area are relevant in order to generate individual and collective changes that contribute to social transformation and improved quality of life. Works that describe the clinical and epidemiological profile of individuals with glaucoma will contribute to a better understanding of the processes involved in this disease, favoring also the identification of risk factors, allowing multidisciplinary care and comprehensive approach to the health condition of this population.

This study is aimed to evaluate the clinical and epidemiological profile of patients with primary open-angle glaucoma.

Methods

This is a quantitative study with analytical and cross-sectional design.

The target population consisted of 3198 patients with GPAA who were cared for at a Specialized Ophthalmology Unit located in the north of the state of Minas Gerais from 2004 to 2015. To define the number of participants we considered the following parameters: proportion estimated in 50% of patients with risk factors for APAG, 95% confidence level, sample error (5%) and population size of 3198. A 20% increase was made for the non-response rate. The calculations evidenced the need to interview and examine at least 413 patients.

We used simple random sampling. We identified individuals by numbers from 1 to 3198 and drew 475 using the program Minitab. Of these, 50 (10,5%) did not agree to participate in the study or did not attend the examination. The final sample consisted of 425 individuals, who signed the Informed Consent Form.

The subjects were selected considering the inclusion criteria of being a patient of the service, having a diagnosis of APAG and being 18 years of age or older. No individuals with other types of glaucoma, hypertensive ocular, suspected glaucoma, and optic neuropathies of other etiologies participated in the study.

We collected all the data from a form we created especially for this study, addressing demographics (gender, age and skin color) and clinical information concerning risk factors for developing glaucoma (family history of glaucoma, hypertension and DM).

After telephone contact, we made an appointment for the completion of the form and the carrying out of tests to evaluate the anatomical and functional changes that occur in the angle of the anterior chamber of the eye, the optical disc, visual field and IOP measurement, which normal value is up to 21 mmHg.[13] The ECC, which the average adopted value considered normal was 535 microns, and auto refraction were also measured.

When they reached the center for the exams, participants filled out the form with their data. Then, we performed the tests: measurement of ECC in the pachymeter Topcon SP-3000P, and auto-refraction in the device Topcon KR-8000PA to assess whether the patient had myopia >-6.00 diopters;[14] we conducted perimetry, in order to detect defects in the central 30 degrees of the visual field, with TOP strategy, in the automated perimeter Octopus 311, the HAAG-STREIT INTERNATIONAL.

After all the procedures, patients had an appointment with a specialist doctor in ophthalmology. They conducted a gonioscopy with three lens mirrors (ocular instruments, inc.), and also with a slit lamp Topcon SL-2ED, to classify the angle of the anterior chamber open or closed. We measured the IOP using a Goldmann tonometer (AT 900 model, HAAG-STREIT INTERNATIONAL), for being a practical and reliable method of measurement[15] after instillation of anesthetic eye drops and fluorescein.

Next, we evaluated the optical disc, by means of fundus biomicroscopy, using 78 diopter lens (Volk,) after instillation of tropicamide, to dilate the pupils.

To carry out the statistical analysis we used the Statistical Package for Social Sciences (SPSS) version 19.0. In all statistical analyzes, we considered a significance level of 5%.

We described categorical variables by their frequency distributions; and numeric variables, by means of its descriptive measures (mean, standard deviation and percentiles 25, 50 and 75).

We also evaluated the normality of the variable excavation of the optic nerve using the Kolmogorov-Smirnov test; the results showed that this variable is not normally distributed. Therefore, we adopted a non-parametric test for performing inferences on this variable. To compare the IOP measured according to ECC, we used the Mann-Whitney.

Because it is a study involving humans, we conducted the research after being approved by the Ethics Committee of the Universidade Estadual de Montes Claros, which took into account their ethical precepts, being adopted under the instruction no. 911.256.

Results

The sample consisted of 425 individuals with POAG, of which 56.8% were female. The mean age of the subjects was 57.7 (± 14.5) years.

There was a predominance of age ≥ 61 years (44%), and self-reported skin color as brown (81,7%) (Table 1).

When we assessed other risk factors, 46,6% had a family history of POAG, 49.2% had hypertension and 17.9% reported being diabetic (Table 2).

Table 3 presents the averages of the clinical characteristics of the glaucoma, in the study participants.

When we evaluated the visual fields, 74.6% subjects showed changes in the right eye (RE), and 67.5% in the left eye (LE). In the evaluation of the fundus, we discovered that the excavation of the optic disc was greatly increased (≥ 0.8) both in the right eye (58.5%) and in the left eye (60.2%) (Table 4).

Table 1
Distribution of patients with Primary Open-Angle Glaucoma who visited the Specialized Care in Ophthalmology Unit according to demographic characteristics

	Variáveis	n	%
Gender*			
	Female	241	56.8
	Male	183	43.2
Age group*			
	≤ 40 years	49	11.6
	41 to 50 years	61	14.4
	51 a 60 years	127	30.0
	≥ 61 years	187	4.0
Skin color*			
	Yellow	1	0.2
	White	46	10.8
	Black	31	7.3
	Brown	346	81.7
Total		**425**	**100.0**

*lack of information on 1 patient

Table 2
Distribution of patients with Primary Open-Angle Glaucoma treated at the Specialized Care in Ophthalmology Unit according risk factors

	Variáveis	n	%
Family history of POAG			
	Yes	198	46.6
	No	227	53.4
Hypertension			
	Yes	209	49.2
	No	216	50.8
Diabetes	Yes	76	17.9
	No	349	82.1
Total		**425**	**100.0**

POAG: Primary Open-Angle Glaucoma

Table 3
Clinical characteristics of patients with Primary Open-Angle Glaucoma treated at the Specialized Care in Ophthalmology Unit

Variables	Minimum	Maximum	mean(±dp)
IOP - RE	8.0	43.0	15.4 (±4.2)
IOP - LE	5.0	40.0	15.1 (±4.2)
Excavation of the optic nerve - RE	0.0	1.0	0.8 (±0.2)
Excavation of the optic nerve - LE	0.2	1.0	0.7 (±0.2)
Paquimetry - RE	387.0	596.0	489.6 (±36.8)
Paquimetry- LE	364.0	591.0	492.8 (±36.0)
Auto refraction- RE	-12.8	5.3	-0.3 (±2.2)
Auto refraction- LE	-15.5	6.8	-0.2 (±2.2)

OD: right eye; OE: left eye; IOP: intraocular pressure; dp: standard deviation

Table 4
Distribution of patients with Primary Open-Angle Glaucoma treated at the Specialized Care Unit in Ophthalmology according to clinical examination

	Variables	n	%
Visual field – RE*	Normal	136	32.5
	Changed	283	67.5
Visual field – LE*	Normal	106	25.4
	changed	313	74.6
IOP – RE	≤ 15	247	58.1
	>15	178	41.9
IOP – LE	≤ 15	260	61.2
	>15	165	38.8
Optic nerve excavation - RE	Normal (<0.6)	32	7.5
	Moderately increased in (0.6 to 0.79)	144	34.0
	Very increased (≥ 0.8)	248	58.5
Optic nerve excavation – LE	Normal (<0.6)	43	10.2
	Moderately increased in (0.6 to 0.79)	126	29.6
	Very increased (≥ 0.8)	256	60.2
ECC – RE	Ideal (> 535)	19	4.5
	Low (≤ 535)	406	95.5
ECC – LE	Ideal (> 535)	27	6.4
	Low(≤ 535)	398	93.6
Auto refraction -RE**	Not short-sighted	211	51.2
	Light myopia	163	39.6
	Moderate myopia	27	6.6
	High myopia	11	2.7
Auto refraction -LE	Not short-sighted	226	55.1
	Light myopia	152	37.1
	Moderate myopia	20	4.9
	High myopia	12	2.0
Total	**425**	**100**	

RE: right eye; LE: left eye; IOP: intraocular pressure; ** Absence information 05 patients; *** Auto refraction not myopic: 0, light Myopia: 0 to -2.99, moderate myopia: -3.00 to -5.99 and severe Myopia:> -6.00.

It was possible to observe that 95.5% of participants had decreased ECC (≤ 535) in the right eye, and 93.6% in the left eye, respectively. Regarding auto refraction, 2.7% of subjects had high myopia in RE, and 2.9% in the LE (Table 4).

Regarding the excavation of the optic disc, we observed that both the right eye and the left showed 50 and 75 percentile equal to 0.80, which implies that 50% of the patients have the excavation of the optic disc superior than or equal to 0.8. The 25 percentile was equal to 0.7 in both eyes, indicating that 25% of patients have the excavation of the optic nerve less than or equal to 0.70. The average of the excavation was equal to 0.75 and 0.74 in right and left eyes, respectively (Figure 1).

Table 5 presents the descriptive measures of intraocular pressure (IOP) of the right and left eyes, according to the ECC. We observed that there was a statistically significant difference in IOP in the left eye (p = 0.026). Patients with low ECC showed IOP values less important. In the right eye there was no significant difference (p = 0.086).

Table 5
Comparison between the IOP of patients with Primary Open-Angle Glaucoma according to ECC

Intraocular pressure among individuals with POAG									
	Ideal ECC				Low ECC				p-value*
	Average (d.p)	P25	P50	P75	Average (d.p)	P25	P50	P75	
RE	1.5(3.0)	14.0	16.0	19.0	15.3(4.2)	12.0	15.0	17.0	0.086
LE	17.9(7.3)	14.0	16.0	18.8	15.0(3.9)	12.0	14.0	17.0	0.026

POAG: primary open-angle glaucoma; RE: right eye; LE: left eye; P25: 25th percentile; P50: 50th percentile; P75: 75th percentile; * Mann-Whitney test.

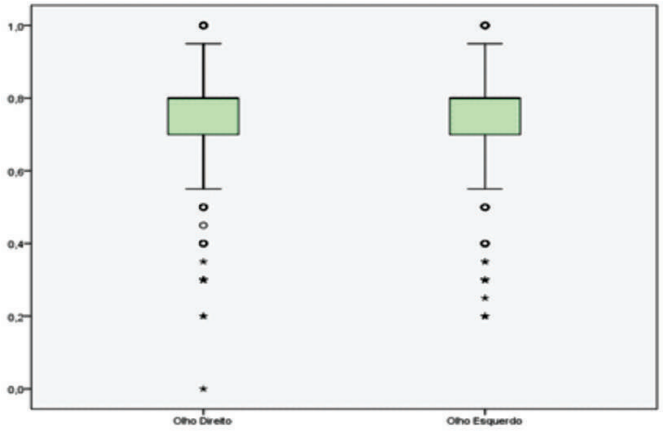

Figura 1: Optic nerve excavation

Discussion

The results showed a predominance of females. Prevalence studies of POAG differ in relation to gender. Some authors reported that women are more affected than men,[16,17] and others,[2,18] that men are more likely to have glaucoma.

In this investigation, there was a predominance of glaucomatous individuals aged over 60 years. This result is similar to the national study findings[19] and international[20], which observed higher incidence of POAG in this age group.

Most participants in this study are self-reported as brown, synthesis of a variety of classifications that express the character of miscegenation of the Brazilian population.[21] Study in US territory revealed prevalence of POAG in black people, six times higher than in whites.[22] The results of this study connote discussion around the concepts of race and ethnicity and imperfection of self-referrals on skin color.[22]

Most of the subjects evaluated had ECC ≤ 535 micrometers. The mean IOPs might be underestimated, since the thinner the corneas, the lower the PIOs.[23] Study to demonstrate the utility of measuring ECC to evaluate the IOP found also a lower IOP average in corneas with decreased center thickness.[24]

In this study, we observed that almost half of patients with POAG had hypertension. Other studies have shown differing results, Díaz et al.,[24] in a study conducted in Cuba, found 62% of occurrence of hypertension; Zao et al.,[18] found 9.17% in patients in China. In a study conducted in the city of Santa Maria, in the south part of Brazil, Rossi et al.,[25] found 48.2%, a very close percentile to the findings of this investigation.

Among the participants, 17.9% declared themselves diabetics. However, it is referenced in the literature that approximately 50% of people with diabetes are unaware of the fact that they are carriers of this disease.[26] A systematic review and meta-analysis of case-control and cohort studies conducted by Zhou et al.,[27] emphasized a significant association between diabetes and increased risk of developing primary open-angle glaucoma.

In the present study, we observed an increase of the excavation ≥0.8 in 60% of individuals, close to the results of the findings of Osaki et al.,[28] who analyzed patients referred to the glaucoma Service of Santa Casa de Misericórdia de São Paulo, finding 67.7% with total excavation of 0.8.

Family history is another important risk factor for glaucoma. First-degree relatives of patients with POAG have a risk 10 times greater of having the disease than people who have no family history.[10] Nearly half of the study participants had a family history of glaucoma, more than double that the findings of Kong et al.,[29] in which 21.49% of POAG patients had a positive family history.

We found that most of the patients showed changes in visual fields in both eyes. Peripheral vision is the most susceptible to glaucomatous damage and approximately 50% of retinal ganglion cells must be damaged so visual field defects are detected.[4]

This study had limitations, like other studies in this field.[17] The number of patients with POAG, which declared themselves non-diabetic suggests the possibility that many of them are unaware of their diagnosis. For clarification of this fact, it is necessary to perform or submit complimentary tests.

With regard to skin color, there was a limitation due to the fact that the majority of individuals have self-reported themselves as brown. Participants had four choices (white, black, brown and yellow), and they had to chose the color that fitted them best. The IBGE´s color classification of the skin can be arbitrary and have limitations, but it is the only source of categories at a national level.[21,30]

Conclusion

In the present study, most subjects had advanced glaucoma, with increased excavation of the optic disc and changed visual fields. The most frequent risk factors were advanced age, hypertension, central corneal thickness decreased and positive family history of glaucoma. Early diagnosis and treatment can prevent against the loss of vision due to this disease. Primary care doctors should refer patients who have risk factors to a specialist for consultation and eye exams. Therefore, it is essential that from the formulation to the implementation of policies and programs of primary health care, the factors associated with glaucoma are taken into consideration.

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