

# Evaluation of Depressive Symptoms in Elderly With Glaucoma

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## Research Article

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# Abstract

**Purpose:** The aim of this study was to assess the presence of depressive symptoms in elderly people with glaucoma and other clinical and epidemiological factors that were associated to the presence depression.

**Methods:** A cross-sectional study was carried out at the Hospital de Olhos Leiria de Andrade, including volunteers aged 60 years or over. Individuals were separated into patients with glaucoma and patients without glaucoma. Volunteers responded a questionnaire, containing data from clinical history and the Geriatric Depression Scale – 15, and were submitted to a complete ophthalmological evaluation.

**Results:** Overall, 42 patients in the glaucoma group and 40 patients in the non-glaucoma group were evaluated. The mean age among cases was 70.2 years, while in the control group it was 65.7 years. The evaluation of the Geriatric Depression Scale – 15 showed an average score of 4.21 and 3.82 in the case and control groups, respectively, with no statistical difference. However, the worsening of visual acuity was related to a greater number of depressive symptoms when comparing individuals with glaucoma. When analyzing the correlation between age, in both groups, and the number of depressive symptoms, there was no statistical significance.

**Conclusion:** The presence of glaucoma was not associated with an increase in the Geriatric Depression Scale-15 score. However, the worsening in visual acuity was correlated to a greater number of depressive symptoms.

## Introduction

Among mood disorders, depression is the most common in the elderly.<sup>1</sup> Its prevalence has been increasing in recent decades. Several chronic diseases are known for the possibility of triggering "secondary" depression, including eye disorders, which can increase the occurrence of this disease due to social, economic and daily life activities impairment.<sup>2,3</sup>

Primary open angle glaucoma (POAG) is a chronic and progressive optic neuropathy, characterized by irreversible visual campimetric loss, which can be correlated with mood disorders, especially depression. It is estimated that the prevalence of depression in individuals with glaucoma is between 10 and 32%, being more frequent in women and older patients.<sup>4,5,6,7,8,9</sup> The presence of depression can lead to an inadequate adherence to the treatment of glaucoma, preventing the proper control of the disease and leading to even more serious conditions, which could possibly intensify previously present depressive symptoms or trigger a new mood disorder.<sup>10,11</sup>

Several factors are associated with impaired quality of life in glaucoma, including loss of visual field, decreased visual acuity, side effects of treatment, costs of eye-drops, misinformation about the disease, disharmony in the doctor-patient relationship and the number of trabeculectomies performed. This can

affect daily activities such as eating, reading, leaving the house and walking, thus causing anxiety, social distancing and physical symptoms.<sup>12, 13</sup>

The Geriatric Depression Scale-15 (GDS-15) is a globally validated instrument for screening depressive symptoms in elderly people of different age groups, carried out by an interviewer and presenting satisfactory reliability and feasibility in different samples in Brazil for scientific works.<sup>5</sup> A study carried out in Brazil showed a prevalence of approximately 20% positive screening for depression by the GDS-15, when evaluating individuals over 60 years of age, indicating female gender, single status, smoking habit, low income and recent hospitalizations as the main risk factors for the disease.<sup>12</sup>

Thus, the aim of this study was to assess the presence of depressive symptoms in glaucoma patients, as well as the sociodemographic profile of the participants and clinical data, including, time since glaucoma diagnosis, best-corrected visual acuity (BCVA), number of eye drops used and family history of glaucoma.

## Methods

### Study design

A cross-sectional study was carried out during 2020 at the Hospital de Olhos Leiria de Andrade, using a questionnaire for clinical e sociodemographic evaluation and a complete ophthalmological evaluation. Volunteers were divided into groups: one containing glaucoma patients and the other consisting of patients without glaucoma of the refraction sector.

### Participants' selection

Among the inclusion criteria were age  $\geq 60$  years old, being a patient with a medical record registered at the Hospital de Olhos Leiria de Andrade and signing the Informed Consent Form. The exclusion criteria were impossibility to answer the questionnaire and presence of ophthalmologic comorbidity with significant impairment of corrected visual acuity for patients in the control group. To be included in the glaucoma group, the patient had to be previously pointed to have a cup-to-disk ratio greater than 0.8 or asymmetry between disks greater than 0.3 associated with defects in automatic perimetry or optical coherence tomography.

### Participants' assessment

Volunteers were asked to answer to a questionnaire containing sociodemographic information, clinical data questions, including number of drops used, time passed since the diagnosis of glaucoma, family history of glaucoma and previous ophthalmic and systemic comorbidities. The GDS-15 evaluation was included in the final section of the questionnaire. After that, the participants were submitted to a complete ophthalmological evaluation.

### Statistical analysis

Data were expressed as absolute and percentage frequency and associated using Fisher's exact test, Pearson's chi-square test or Mann-Whitney U test. All analyzes were performed using SPSS v20.0 software for Windows, adopting 95% confidence.

## Results

### Participant's profile

Overall, 82 volunteers were evaluated, including 42 with glaucoma and 40 without the disease. The mean age was 70.2 years in the case group and 65.7 years in the control group. Sixteen (38.1%) men and 26 (65.9%) women made up the case group, while 12 (30.0%) men and 28 (70.0%) women participated in the control group. Regarding the educational status, five (11.9%) glaucoma patients had completed high school, while, in the control group, 13 (32.5%) participants had completed high school. Regarding systemic comorbidities, systemic arterial hypertension was the most prevalent among the participants, affecting 18 (42.9%) patients in the case group and 19 (47.5%) participants in the control group. There were no statistical correlation of ophthalmic or systemic comorbidity and positive screening for depression. Regarding BCVA, 33 (78.6%) patients with glaucoma had a result better than 20/80 and nine (21.4%) had a BCVA of 20/80 or worse, while all volunteers in the control group had a BCVA better than 20/80. (Table 1)

In the glaucoma group, the time elapsed after the diagnosis of the disease until the time of the interview was up to one year for six (14.3%), between over one year and five years for 21 (50.0%), between over five years old to ten years for eight (19.0%) and over ten years old for seven (16.7%) individuals, respectively. The number of different ocular hypotensors used daily for glaucoma patients was zero for seven (16.7%), one for 17 (40.5%), two for ten (23.8%), three for seven (16.7%) and four to one (2.4%) participant, respectively. (Table 2)

### Depressive symptoms evaluation

The mean scores on the GDS-15 were 4.21 ( $\pm$  2.54) for the glaucoma group and 3.82 ( $\pm$  1.90) for the non-glaucoma group, with no statistically significant difference between groups. When evaluating the difference between groups of GDS-15 > 5, considered a positive screening for depression, there was also no statistical difference. (Table 3)

When comparing GDS-15 > 5 with increases in the number of different ocular hypotensors used and age, no statistical differences were demonstrated. When comparing the time passed since the diagnosis of glaucoma, patients with > 5 years of diagnosis did not present a higher prevalence of GDS-15 > 5 ( $p$  = 0.053). Gender, schooling status and comorbidities were also not associated to a positive screening for depression. (Table 4)

Regarding visual acuity, glaucoma patients with BCVA better than 20/80 obtained 3.57 ( $\pm$  2.15) as a mean in the GDS-15, contrasting with individuals whose BCVA was equal to or less than 20/80, whose

mean was 6.55 ( $\pm$  2.60), demonstrating a statistical difference between worsening in BCVA and increase in GDS-15 ( $p = 0.004$ ) in the glaucoma group. (Table 5)

## Discussion

Depression is a multifactorial disease, with some well-established risk factors such as old age, presence of chronic illnesses, lack of bonds and social support. Beyond that, it has a complex pathophysiology with many supporting mechanisms and factors yet to be clarified. The importance of better understanding about its triggers is notorious, as the disease has a considerable prevalence worldwide, especially in the elderly, and courses with cognitive impairment, sleep disorders, physical symptoms and behavioral changes, resulting in a significant impact on the quality of life.<sup>14</sup>

Berchuck et al evaluated the presence and the development of anxiety and depression among 3259 individuals mean age 60 years at baseline with glaucoma suspect for an average of 3.6 years, in which 911 (28%) were confirmed for glaucoma. Among the participants, 33% presented depression and 19% were diagnosed with depression and anxiety. There was a significant association between psychiatric disorders and the development of glaucoma.<sup>15</sup>

One European population-based study assessed the presence of depressive symptoms in 14,657 individuals aged 35–74 years old using the Patient Health Questionnaire (PHQ-9), including 293 participants with self-reported glaucoma. A positive screening for depression was observed in 6.6% (95% CI 4.1–10.3) and 7.7% (95% CI 7.3–8.2) of the participants with and without glaucoma, respectively.<sup>16</sup> Another research, developed in Brazil, using the Hospital Anxiety and Depression Scale (HADS), found a prevalence of depression and anxiety of 3.10% and isolated depression of 2.3% among 129 glaucoma patients of mean age 70.14 years old.<sup>17</sup> When comparing gender and depression among glaucoma patients, some studies found a significant higher prevalence of depression in women.<sup>15,17</sup> In our data, there was no statistical difference regarding gender and age in terms of depressive symptoms.

Abe et al also pointed a higher prevalence of depressive symptoms in glaucoma patients with comorbidities.<sup>17</sup> In our data, there was no association of a positive screening for depression and isolated systemic or ocular comorbidities. Other factors that were described to be associated to a higher presence of depressive symptoms were low comprehension of glaucoma, IOP < 21mmHg.<sup>18,19</sup> This study also evaluated the correlation of age and depressive symptoms, finding no statistical significance when comparing these variables. Glaucoma inpatients were also pointed to have more depressive symptoms and lower disease knowledge than day-ward patients in a study comparing volunteers who were about to receive a glaucoma surgery for the first time.<sup>20</sup> Although our study did not evaluate the comprehension of glaucoma among the participants, the frequency of GDS-15 > 5 was higher among glaucoma patients with lower schooling status, however there was no statistical significance in this analysis ( $p = 0.053$ ).

Regarding the influence of the visual field in the development of depression, Agorastos et al utilized the Beck's Depression Inventory–II (BDI–II) to assess depressive symptoms among glaucoma patients older

than 50 years, pointing a higher prevalence among patients with moderate/severe visual field defects for six months.<sup>21</sup> Other studies also observed a higher prevalence of psychiatric diseases in patients with worse values of mean deviation (MD) in the perimetry.<sup>15,22,23</sup> Contrastingly, Abe et al did not observe statistical differences regarding MD and visual acuity in the presence of depression among glaucoma patients in a transversal study.<sup>17</sup>

Jampel et al proposed that the visual function is more important to determine depressive manifestations than monocular best VA values.<sup>24</sup> Onwubiko et al, found a higher prevalence of depressive symptoms in glaucoma patients with worse BCVA<sup>19</sup> and an American data including 7584 participants suggests that elderly with self-reported visual impairment, independently of the cause, are more likely to evolve with depressive symptoms.<sup>25</sup> Our data suggested that the worsening of the BCVA was associated to a higher score in the GDS – 15 and to a positive screening for depression.

Among the limitations of the study, the cross-sectional design limited the assessment of the relationship between disease progression, BCVA variation and development of depressive symptoms. Furthermore, BCVA values were only arranged as better than or equal to 20/80 and worse than 20/80, limiting the comparison of depressive symptoms in a more detailed BCVA stratification. Beyond that, there was also no quantitative or qualitative evaluation of the visual perimetry effect and no estimation of visual functionality parameters. Furthermore, only elderly people were included in the study, which is the group in which there is scientific validation of the use of GDS-15, however this selection restricts the methodology of this study with regard to population inferences.

## Conclusion

The presence of glaucoma was not associated with an increase in the score on the GDS-15. However, the worsening in visual acuity was related to a greater number of depressive symptoms in individuals with glaucoma. Thus, further studies are needed to better analyze the correlation between the profile of patients with glaucoma and symptoms of depression.

## Declarations

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**Availability of data and material:** The applied questionnaires are in possession of the authors.

**Authors' contribution:** All authors have contributed equality to this article.

**Ethics approval:** N° CAAE: 27322619.7.0000.5049, following ethical guidelines of resolution 466/12 of the National Health Commission.

Consent to participate: All volunteers provided a written informed consent to participate in this study.

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## Tables

Table 1  
Profile of the participants.

Variable		Glaucoma group (N = 42)	Non-glaucoma group (N = 40)
Gender	Male	16 (38.1%)	12 (30.0%)
	Female	26 (65.9%)	28 (70.0%)
Schooling	Illiteracy	7 (17.1%)	3 (7.5%)
	Incomplete primary education	23 (56.1%)	10 (25.0%)
	Complete primary education	4 (9.8%)	6 (15.0%)
	Incomplete secondary education	2 (4.9%)	0 (0.0%)
	Complete secondary education	4 (9.8%)	13 (32.5%)
	Incomplete tertiary education	0 (0.0%)	1 (2.5%)
	Complete tertiary education	0 (0.0%)	5 (12.5%)
	Post-graduation	1 (2.4%)	2 (5.0%)
Systemic comorbidities	Hypertension	18 (42.9%)	19 (47.5%)
	Diabetes	12 (28.6%)	10 (25.0%)
	Dyslipidemia	1 (2.4%)	2 (5.0%)
	Chronic kidney disease	1 (2.4%)	2 (5.0%)
	Others	7 (16.7%)	5 (12.5%)
Family history of glaucoma	Yes	13 (31.0%)	18 (45.0%)
	No	29 (69.0%)	22 (55.0%)
Best-corrected visual acuity	Better than 20/80	33 (78.6%)	40 (100%)
	Equal to or worse than 20/80	9 (21.4%)	0 (0.0%)

N (%).

Table 2  
Clinical data of the participants with glaucoma.

Time since the diagnosis of glaucoma	≤ 1 years	6 (14.3%)
	> 1 years and ≤ 5 years	21 (50.0%)
	> 5 years and ≤ 10 years	8 (19.0%)
	> 10 years	7 (16.7%)
Number of different ocular hypotensors used	0	7 (16.7%)
	1	17 (40.5%)
	2	10 (23.8%)
	3	7 (16.7%)
	4	1 (2.4%)

N (%).

Table 3  
Evaluation of depression symptoms among glaucoma and non-glaucoma groups.

Variable		Glaucoma group	Non-glaucoma group	p-value
Mean GDS-15 score		4.21 (± 2.54)	3.82 (± 1.90)	0.592 <sup>a</sup>
GDS-15 > 5	Yes	12 (28.6%)	14 (35.0%)	0.532 <sup>b</sup>
	No	30 (71.4%)	26 (65.0%)	

GDS-15 = Geriatric Depression Scale – 15; Mean (±SD); N (%). <sup>a</sup>Mann-Whitney U test; <sup>b</sup>Chi-square test.

Table 4

Influence of clinical and demographic factors in the presence of positive screening for depression in patients with glaucoma.

Variable		GDS-15 > 5	GDS-15 ≤ 5	p-value
N		12	30	
Mean age <sup>a</sup>		73.33	68.96	0.315
Mean of different ocular hypotensors used <sup>a</sup>		1.66	1.40	0.493
BCVA <sup>b</sup>	Better than 20/80	5	28	< 0.001*
	Equal to/worse than 20/80	7	2	
Gender <sup>b</sup>	Male	5	11	0.763
	Female	7	19	
Completed high school <sup>b</sup>	Yes	0	5	0.132
	No	12	25	
Presence of cataract <sup>b</sup>	Yes	7	17	0.921
	No	5	13	
Presence of arterial hypertension <sup>b</sup>	Yes	6	11	0.426
	No	6	19	
Presence of diabetes <sup>b</sup>	Yes	5	5	0.086
	No	7	25	
Family history of glaucoma <sup>b</sup>	Yes	6	7	0.091
	No	6	23	

GDS-15 = Geriatric Depression Scale – 15; BCVA = best-corrected visual acuity. \*p < 0.05; <sup>a</sup>Mann-Whitney U test; <sup>b</sup>Chi-squared test

Table 5  
Evaluation of Geriatric Depression Scale – 15 score and  
visual acuity among the glaucoma group.

<b>Visual acuity</b>	<b>Mean score (±)</b>	<b>p-value</b>
Better than 20/80	3.57 (± 2.15)	0.004*
Equal to/worse than 20/80	6.55 (± 2.60)	

\*p < 0.05. Mann-Whitney U test