ORIGINAL ARTICLE

Depression and anxiety rates in Turkish glaucoma patients and glaucoma subtypes

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ABSTRACT

Purpose: To compare the rates of depression and anxiety in glaucoma patients and glaucoma subtypes with individuals without a glaucoma diagnosis.

Materials and Methods: This cross-sectional study included 132 glaucoma patients and 65 control patients of similar age and gender. A 13-item sociodemographic form, a 21-item self-report question, Beck Depression Inventory-II (BDI-II) and Beck Anxiety Inventory (BAI) have been filled by all participants. BDI-II scores for depression ranged from 10-16 points for mild depression, 17-29 points for moderate depression, and 30-63 points for severe depression. According to the BAI results, mild anxiety ranged from 8-15 points, moderate anxiety ranged from 16-25 points, and severe anxiety ranged from 26-63 points.

Results: BDI-II mean score of the glaucoma group was 10.14±7.1, and it was 8.5±6.9 in the control group; The mean score of the BAI scale was 9.08±7.8 in the glaucoma group, and it was 8.17±7.8 in controls (p=0.109, p=0.207, respectively). Depression rate was 50.8% in the glaucoma group, 44.6% in the control group, and anxiety rate was 46.2% in both groups (p=0.628, p=0.624, respectively). Although the mean scores of BDI-II and BAI and the rate of depression were higher in the glaucoma group, there was no statistically significant difference. No significant difference was found in glaucoma subtypes either. In all participants, women had a higher depression and anxiety rate than males. (p=0.045*, p=0.002**, respectively)

Conclusion: There was no significant difference in the rates of depression and anxiety in glaucoma patients compared to the control group according to the BDI-II and BAI scales. However, the rates of depression and anxiety in both groups were higher than the prevalence of these diseases.

Keywords: Anxiety, beck anxiety inventory, beck depression inventory-II, depression, glaucoma.

INTRODUCTION

Glaucoma is a chronic disease that causes irreversible visual field defects and vision loss if it is not diagnosed and treated promptly. It is predicted to affect approximately 112 million individuals by 2040.[1] Since it is a silent, chronic disease with no clinical symptoms at the onset, it is frequently misdiagnosed and underestimated.[2] Previous research has identified various risk factors for glaucoma; including age, race, gender, intraocular pressure (IOP), family history, and diabetes mellitus.[3,4] Glaucoma is more common in individuals with chronic diseases such as hypotension, hypertension, obstructive sleep apnea and migraine.[5] Myopia has been found to be a significant risk factor for glaucoma.[6] Primary open angle glaucoma (POAG) and primary angle-closure glaucoma (PACG) are the two broad classifications of glaucoma, with POAG being the more common.[1] Pseudoexfoliation glaucoma (PEG), pigmentary glaucoma due to pigment dispersion syndrome, steroid-induced glaucoma could be counted among the secondary open-angle glaucoma (SOAG) type.[7-9] The diagnosis of "glaucoma suspicion" is determined by the presence of at least one of the following criteria: elevated IOP, suspicious optic disc appearance, visual field

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defect compatible with optic nerve injury seen on repeated tests, and a family history of glaucoma.[10]

In Turkey, 2.5% of the population has glaucoma, and it is estimated to be more prevalent in the geriatric population.[11] In glaucoma; optic nerve damage cannot be reversed, despite the frequent use of multiple eye drops and surgical procedures. Numerous patients show disease progression despite treatment. Depression and anxiety may be more prevalent among glaucoma patients than the general population as a consequence of their concern of potential vision loss. There are also studies confirming that beta blockers, which are among the antiglaucoma medications used by patients, induce depression.[12] An estimated 10.9% to 24.7% of glaucoma patients may suffer from depression, and 13% to 30% might have anxiety.[13,14]

In this study, we aimed to compare the rates and risk factors of depression and anxiety in patients who administered for routine follow-up at the glaucoma subspecialty clinic of a training and research hospital, with the healthy population of similar age and gender without glaucoma. We also compared the glaucoma group according to the glaucoma subtypes (POAG, PACG, SOAG and glaucoma suspects) and whether the topical antiglaucomatous drops they use include beta-blockers or not. In addition, we divided glaucoma patients into three stages according to the Bascom Palmer system and analyzed their outcomes: early, moderate, and advanced-stage glaucoma.[15] To the best of our knowledge, this is the first study to compare more than two types of glaucoma in terms of depression and anxiety rates.

MATERIALS AND METHODS

Study Design

In this observational, cross-sectional study, 132 patients with glaucoma or glaucoma suspects who applied for routine follow-up at the glaucoma subspecialty clinic of Sultan Abdülhamid Han Training and Research Hospital were compared to 65 healthy control patients of similar age and gender who did not have a diagnosis of glaucoma/glaucoma suspicion. The control group was selected among the patients who applied to the ophthalmology outpatient clinic of our hospital for routine eye examination. All participants provided written consent to participate in the study. The study's data acquisition conducted between 1 April 2023 and 1 July 2023. The study was approved by the Haydarpaşa Numune Training and Research Hospital Training and Research Hospital Human Research Ethics Committee (HNEAH-KAEK 2023/KK46) and performed according to the ethical principles of the Declaration of Helsinki.

All patients underwent a detailed ophthalmological examination. Best corrected visual acuity (BCVA), IOP measurements, slit-lamp anterior segment and anterior chamber angle findings based on gonioscopy, and dilated fundus examination findings were recorded for all patients. All participants' prior eye surgeries or traumas were questioned.

Patients who were followed up in our glaucoma subspecialty clinic for at least 1 year were included in the study. Glaucoma diagnosis was based on glaucomatous cup/disc ratio and glaucomatous visual field defects in one or both eyes, with or without IOP elevation. Types of glaucoma and the antiglaucomatous drops they used were recorded.

Individuals are considered "glaucoma suspects" if they have at least one clinical feature of the disease; such as an elevated IOP or cup/disc ratio, a repeatable visual field abnormality consistent with optic nerve damage, or a strong family history of glaucoma. We used Hodapp-Parrish-Anderson (HPA) criteria which are have been the most widely accepted method for identifying the earliest glaucomatous damages and borderline cases in recent decades. The three minimum diagnostic criteria for glaucomatous defect are as follows:

1) Glaucoma Hemifield Test (GHT) in excess of normal limits in at least two fields

2) A cluster of three or more nonedge points in a typical glaucoma location, of which two are depressed on the pattern deviation plot at a p value of less than 5% and one is depressed at a p value of less than 1% on two contiguous fields.

3) Pattern standard deviation (PSD) occurring in fewer than 5% of normal fields on two consecutive fields.[16]

POAG diagnosis is made by these criteria; findings indicating optic nerve damage (structural anomalies in the optic disc or retinal nerve fiber layer (diffuse or focal narrowing or notching in the optic disc rim, especially in the superior or inferior poles, diffuse or localized thinning in the RNFL, hemorrhage in the optic disc, asymmetry in the optic disc between the eyes, beta-zone parapapillary atrophy), adult onset, clear angle on gonioscopy, and absence of factors causing secondary glaucoma. In addition to the above-mentioned optic disc, visual field

or RNFL findings and open angle on gonioscopy, patient was classified as SOAG if there was pigment dispersion syndrome, pseudoexfoliation syndrome, uveitis, trauma or corticosteroid use, which could lead to glaucoma.[17]

In addition to the visual field, RNFL, and optic disc examination criteria described previously, PACG was defined by the absence of findings associated with angle closure, such as peripheral anterior synechiae or new vessels in the angle, and the non-visible posterior trabecular meshwork at 270° or more on gonioscopy.[18]

Additionally, all glaucoma patients were classified as early-stage, moderate-stage, and advanced-stage glaucoma patients according to the visual field results. Bascom Palmer system was used in this classification. This staging system distributes glaucoma patients to different stages of disease progression based on the mean defect (MD) score and one of the following: pattern deviation probability plot score (indicating deviation from a normalized visual field pattern), dB plot (stages 2 to 4), or, for stage 1, either corrected pattern standard deviation/ pattern standard deviation or glaucoma hemifield test results.[15]

The control group consisted of patients who were not diagnosed with glaucoma, did not use antiglaucomatous drops, had IOP lower than 21 mm Hg, and presented no suspicious anterior segment, angle, or fundus examination findings.

Inclusion and Exclusion Criteria:

Participants in the study were adults over the age of 18 who could speak and read Turkish and did not have a neurological or psychiatric disorder that would prevent them from completing the scale. The BCVA of all participants were at least 6/10 and above in each eye according to the Snellen chart. None of the participants had been previously diagnosed with depression or anxiety by a psychiatrist.

In both groups, patients with corneal and retinal pathologies that may cause low vision, as well as patients with low vision due to cataracts and those who have been taking antidepressant medication, were excluded.

Questionnaires

The Beck depression inventory-II (BDI) and Beck anxiety inventory (BAI) have been used to assess levels of depression and anxiety. The patients' sociodemographic information, including their employment status, income level, place of living, and level of education, were recorded on a sociodemographic form.

Beck Depression Inventory-II (BDI) and Beck Anxiety Inventory (BAI):

The BDI-II is a 21-item self-report questionnaire designed to measure the severity of depressive disorders. Items are rated from 0 to 3, with higher scores indicating more severe symptoms.[19] Patients with 10-16 points were classified as mild depression, 17-29 points as moderate depression, and 30-63 points as severe depression.

The BAI is a 21-item self-report measure designed to reflect the severity of somatic and cognitive anxiety symptoms over the previous week. On a 4-point scale (0–3), items are scored with a total score ranging from 0 to 63.[20] According to the results of the inventory; 8-15 points are considered as mild anxiety symptoms, 16-25 points as moderate anxiety symptoms, 26-63 points as severe anxiety symptoms.

Sociodemographic form:

The sociodemographic form was prepared to establish the participants' information about sociodemographic characteristics and diseases and consisted of 13 questions prepared by the researchers.

Statistical Analysis

Statistical analysis of the investigation was performed using the IBM SPSS 26.0 package program. Descriptive statistics were calculated (frequency, percentage, minimum and maximum values, mean, standard deviation, and median) of glaucoma patients and healthy participants included in the study. Since there was no normal distribution, the Mann Whitney U test was used to compare the BDI-II and BAI scores between the groups. To compare categorical data, a Chi-square test was applied. Shapiro-Wilk test was used to determine whether the parameters were suitable for normal distribution. All statistical analyses were evaluated using a confidence interval of 95%, and significance was evaluated at a $p < 0.05$ level.

RESULTS

132 glaucoma patients and 65 control patients of similar age and gender were included in this study. While 53.8% (n=71) of the glaucoma group consisted of patients with POAG; 30.3% (n=40) had SOAG, 9.8% (n=13) were glaucoma suspects, 6.1% (n=8) had PACG. The average age of the glaucoma group was 62.73±12, while the age of the control group was 60.85±11.3. In the glaucoma group, the rate of female patients was 57.6% (n=76), while the rate of male patients was 42.4% (n=56); in the control group, the rate of female patients was 49.2% (n=32), while the rate of male patients was 50.8% (n=33). In terms of age and gender,

there is no statistically significant variation between the groups; the groups are homogeneous. (p=0.117, p=0.289, respectively) (Table 1).

In terms of job status and ophthalmic surgery history, there is a statistically significant difference between the glaucoma and control groups, according to the sociodemographic form filled by the individuals. While 54.5% (n=72) of the glaucoma group were retired, 28.8% (n=38) were unemployed, and 16.7% (n=22) were working; 50.8% (n=33) of the control group were retired, 13.8% (n=9) were unemployed, 35.4% (n=33) were working (p=0.004**). 34.1% (n=45) of the glaucoma group had undergone a previous ophthalmic surgery; 16.9% (n=11) of the control group had undergone a prior ophthalmic operation (p=0.012). There were no statistically significant differences between the groups regarding marital status, income, place of residence, or level of education (p>0.05 for each). (Table 1)

When we analyzed the BDI-II score averages of the groups; The mean score of the glaucoma group was

Table 1: *Demographic and clinical data of study population*

	Glaucoma Group (n=132)	Control Group (n=65)	p-value
Gender (n)			
Male	42.4% (n=56)	50.8% (n=33)	0.289
Female	57.6% (n=76)	49.2% (n=32)	
Age			
Mean± SD	62.73±12	60.85±11.3	0.117
Type of Glaucoma			
Glaucoma suspect	9.8% (n=13)		
SOAG	30.3% (n=40)		
POAG	53.8% (n=71)		
PACG	6.1% (n=8)		
Number of antiglaucomatous drops			
None	9.8% (n=13)		
1	24.2% (n=32)		
2	37.9% (n=50)		
3	18.9% (n=25)		
4	9.1% (n=12)		
Marital Status			
Single	25% (n=33)	23.1% (n=15)	0.861
Married	75% (n=99)	76.9% (n=50)	
Job Status			
Retired	54.5% (n=72)	50.8% (n=33)	**0.004***
Unemployed	28.8% (n=38)	13.8% (n=9)	
Working	16.7% (n=22)	35.4% (n=23)	
Income			
No regular income	16.7% (n=22)	12.3% (n=8)	0.654
5.5-10kTLper month	52.3% (n=69)	53.8% (n=35)	
10-15kTL per month	19.7% (n=26)	18.5% (n=12)	
15-25kTL per month	9.1% (n=12)	9.2% (n=6)	
>25k TL per month	2.3% (n=3)	6.2% (n=4)	
Place of residence			
City	97.7% (n=129)	98.5% (n=64)	0.173
Rural	2.3% (n=3)	1.5% (n=1)	
Education Level			
Primary school	29.5% (n=39)	29.2% (n=19)	0.203
Secondary school	14.4% (n=19)	12.3% (n=8)	
High School	31.8% (n=42)	21.5% (n=14)	
University	24.2% (n=32)	36.9% (n=24)	
PreviousOphthalmic Surgery			
None	65.9% (n=87)	83.1% (n=54)	**0.012***
Yes	34.1% (n=45)	16.9% (n=11)	

SOAG: Secondary open-angle glaucoma, POAG: Primary open-angle glaucoma, PACG: Primary angle-closure glaucoma

10.14±7.1; and the mean score of the control group was 8.51±6.9. Although the mean score of the glaucoma group was higher than the controls, this difference did not reach a statistically significant level (p=0.109). When we compared the mean BAI scores, the mean score of the glaucoma group was 9.08±7.8, while the mean of the control group was 8.17±7.8. Again, although the mean BAI score of the glaucoma group was higher than the control, this difference was not statistically significant (p=0.279).

When comparing the number of depressed patients, 50.8% (n=67) of the glaucoma group had mild, moderate, or severe depression, whereas 44.6% (n=29) of the control group had depression. Analyzing the number of patients with anxiety, we found that the rate of anxiety was 46.2% (n=61) in the glaucoma group and 46.2% (n=30) in the control group. No statistically significant difference was found between the two groups in both comparisons (respectively; p=0.628, p=0.624). There was no statistically significant difference between the groups according to the severity of anxiety and depression (mild, moderate, or severe) (p>0.05 for each) (Table 2).

The depression and anxiety rates of female participants were statistically significantly higher than male participants, regardless of sociodemographic factors (**p=0.045*, p=0.002**, respectively**). While there was no significant gender-related difference in the rate of depression; no statistically significant differences were found in the rates of depression and anxiety according to the educational status, marital status, antiglaucomatous drops, previous ophthalmic surgeries (p>0.05 for each) (Table 3).

When we compared BDI-II and BAI scores and depression, anxiety rates according to glaucoma subtypes, no statistically significant difference was found between the groups (p>0.05 for each) (Table 4).

There was no statistically significant difference between the groups in terms of BDI-II and BAI score averages and depression, anxiety rates of the patients according to early, moderate and advanced glaucoma stages (p=0.862, p=0.405, p=0.883, p= 0.279, respectively). (Table 5)

DISCUSSION

In this study, we aimed to compare the depression and anxiety rates of glaucoma patients with the healthy control group using BDI-II and BAI scales. We also examined whether there was a difference in these rates between glaucoma subtypes. The rate of patients with mild, moderate or severe depression showing clinical symptoms was 50.8% in the glaucoma group, while this rate was 44.6% in the control group. Although the number of patients with depression was higher in the glaucoma group, the difference between the groups did not reach a statistically significant level (p=0.628). When we analyzed the averages of the BDI-II and BAI scores of the groups; Although the mean score of both scales in the glaucoma group was higher than the control group, this difference did not reach a statistically significant difference (p=0.109, p=0.279, respectively) When we searched the anxiety rates of the groups; We found that the rate of patients with anxiety was 44.6% in both groups (p=0.624). When all patients were considered, the depression and anxiety rate in female gender was found to be statistically significantly

Table 2: *Comparison of BDI-II and BAI scores and depression, anxiety rates*

	Glaucoma Group (n=132)	Control Group (n=65)	p- value
BDI-II score	10.14±7.1 (0-35)	8.51±6.9 (0-30)	0.109
BAI score	9.08±7.8 (0-40)	8.17±7.8 (0-30)	0.279
Depression			
None	49.2%(n=65)	55.4%(n=36)	0.628
Mild	33.3%(n=44)	33.8%(n=22)	
Moderate	15.9%(n=21)	9.2%(n=6)	
Severe	1.5%(n=2)	1.5%(n=1)	
Anxiety			
None	53.8%(n=71)	53.8%(n=35)	0.624
Mild	25.8%(n=34)	29.2%(n=19)	
Moderate	16.7%(n=22)	10.8%(n=7)	
Severe	3.8%(n=5)	6.2%(n=4)	

BDI: Beck depression inventory-II, BAI: Beck anxiety inventory

Table 3: *Depression and anxiety rates according to sociodemographic features.*

	According to BDI-II		P value	According to BAI		P value
	Depression	Normal		Anxiety	Normal	
Gender						
Female (n=108)	55.6%(n=60)	44.4%(n=48)	**0.045***	56.5%(n=61)	43.5%(n=47)	**0.002***
Male (n=89)	40.4%(n=36)	59.6%(n=53)		33.7%(n=30)	66.3%(n=59)	
Antiglaucomatous drop combination with beta-blocker						
Yes (n=90)						
No (n=42)	55.6%(n=50)	44.4%(n=40)	0.107	50%(n=50)	50%(n=50)	0.201
	40.5% (n=17)	59.5% (n=25)		38.1%(n=16)	61.9 (n=26)	
Marital Status						
Single (n=48)	54.2%(n=26)	45.8%(n=22)	0.41	54.2%(n=26)	45.8%(n=22)	0.244
Married (n=149)	47%(n=70)	53%(n=79)		43.6%(n=65)	56.4%(n=84)	
Education Level						
Primary school (n=58)	60.3%(n=35)	39.7%(n=23)	0.197	55.2%(n=32)	44.8%(n=26)	0.338
Secondary school (n=27)	37%(n=10)	67%(n=17)		48.1%(n=13)	51.9%(n=14)	
High School (n=56)	50%(n=28)	50%(n=28)		42.9%(n=24)	57.1%(n=32)	
University (n=56)	41.07%(n=23)	58.93%(n=33)		40.7%(n=22)	59.3%(n=34)	
PreviousOphthalmic Surgery						
None (n=141)	46.1%(n=65)	53.9%(n=76)	0.271	44%(n=62)	56%(n=79)	0.345
Yes (n=56)	55.4%(n=31)	44.6%(n=25)		51.8%(n=29)	48.2%(n=27)	

BDI: Beck depression inventory-II, BAI: Beck anxiety inventory

Table 4: *Comparison of BDI-II and BAI scores and depression, anxiety rates according to glaucoma subtypes.*

	Glaucoma suspects (n=13)	SOAG (n=40)	POAG (n=71)	PACG (n=8)	P value
BDI-II score (min-max)	9.31±4.9 (3-20)	9.13±6.6 (0-29)	10.96±7.5 (0-35)	9.38±9.4 (1-30)	0.573
BAI score (min-max)	10±6 (3-19)	8.53±6.1 (0-24)	9.48±9.1 (0-40)	6.75±5.4 (1-15)	0.686
Depression					
Exist	46.2%(n=6)	42.5%(n=17)	56.3%(n=40)	50%(n=4)	0.554
Don't exist	53.8%(n=7)	57.5%(n=23)	43.7%(n=31)	50%(n=4)	
Anxiety rate					
Exist	46.2%(n=6)	45%(n=18)	47.9%(n=34)	37.5%(n=3)	0.951
Don't exist	53.8%(n=7)	55%(n=22)	52.1%(n=37)	62.5%(n=5)	

SOAG: Secondary open-angle glaucoma, POAG: Primary open-angle glaucoma, PACG: Primary angle-closure glaucoma, BDI: Beck depression inventory-II, BAI: Beck anxiety inventory

Table 5: *Comparison of BDI-II and BAI scores and depression, anxiety rates according to glaucoma stages.*

	Early-stage Glaucoma (n=57)	Moderate-stage Glaucoma (n=52)	Advanced-stage Glaucoma (n=23)	P value
BDI-II score (min-maks)	10.33±7.5 (0-35)	10.02±6.1 (0-27)	9.96±8.5 (0-30)	0.862
BAI-II score (min-maks)	9.37±8.5 (0-40)	9.52±7.4 (0-28)	7.35±7.0 (0-24)	0.405
Depression				
Exist	52.6% (n=30)	48.1% (n=25)	52.2% (n=12)	0.883
Don't exist	47.4% (n=27)	51.9% (n=27)	47.8% (n=11)	
Anxiety rate				
Exist	43.9% (n=25)	53.8% (n=28)	34.8% (n=8)	0.279
Don't exist	56.1%	46.2% (n=24)	65.2% (n=15)	

BDI: Beck depression inventory-II, BAI: Beck anxiety inventory

higher than male gender (p=0.045*, p=0.002*) While there was no statistically significant difference between depression and anxiety rates and other sociodemographic factors, there was no statistically significant difference between the results based on the type of glaucoma or whether the topical antiglaucomatous drops they use include beta-blockers or not (p>0.05 for each) As far as we know, this is the first study to compare the 3 different types of glaucoma and glaucoma suspects in terms of depression and anxiety levels.

Depression is a common mental disorder among individuals with chronic illness.[14] Studies suggest that depression is more prevalent among glaucoma patients than among healthy individuals.[13] When reviewing previous studies conducted on Turks with glaucoma, Elbozan Cumurcu et al. found that the depression rate among glaucoma patients was 24.7%, which was statistically substantially higher than individuals without glaucoma.[21]Another study by Keklikçi et al. also supports this result. The rate of depression in glaucoma patients was found to be 25.2%, this rate was found to be significantly higher than in healthy controls.[22] In this current study, the rate of depression in glaucoma patients was 50.8%. Although this rate was much higher than the existing studies and was higher than the percentage of the control group, it did not reach a statistically significant difference. According to previous studies, the prevalence of older individuals with clinically significant depressive symptoms ranges between 8% and 16%.[23,24] In another recent study conducted with elderly people in Sweden, the rate of self-report depression was reported as 9.1%.[25] When we analyzed these results, the depression rate of both the glaucoma and control groups in our study was found to be much higher than the population prevalence. This situation could be interpreted as the negative effects experienced in Turkey in recent years such as pandemics, economic crisis and natural disasters may have increased the possibility of depressive symptoms not only in glaucoma patients but also in the whole society.

On the other hand, there are studies indicating that depression rates among glaucoma patients are similar to the general population.[26,27] These studies' findings also support our results. To achieve more meaningful results in this regard, it may be beneficial to conduct additional investigations on a larger number of patients.

When we analyzed the anxiety levels in patients with glaucoma; according to the findings of a recent review study, glaucoma patients had a high anxiety level.[28] According to a cross-sectional study conducted in patients with glaucoma in China, the anxiety rate was found to be 12.11% in the study group, and this result was found to be significantly higher than the anxiety rate of the general population of China (2.4%).[29] In another study that took place in Japan with glaucoma patients, the anxiety rate in the study group was 13%; it was found to be 7% in the control group, which was statistically higher than controls.[30] In the study by Tastan et al. in Turkey, the anxiety rate was found to be 14% in patients with glaucoma and no statistically significant difference was found compared to the control group.[11] In our study, the rate of participants with mild, moderate or severe anxiety was found to be 44.6% in both the glaucoma patient group and the control group. While there was no statistically significant difference between the two groups; this rate was much higher than the anxiety level in other studies.

When we searched the studies on depression and anxiety levels according to glaucoma types; in the study of Cumurcu et al.[31], the incidence of depression in both PEG and POAG patients was found to be higher than in the control group. In addition, the depression rate of patients with PEG diagnosis was found to be significantly higher.[31] In another investigation by Kong et al., anxiety and depression rates were found to be higher in PACG patients than in POAG patients.[32] In this current study, when the depression and anxiety rates of patients with POAG, PACG, SOAG and glaucoma suspects were compared, no significant difference was found between the groups. We could not find many studies comparing the rates of depression and anxiety among glaucoma types in the literature, so more studies involving more patients may shed light on this issue.

When we examined the sociodemographic factors that could cause depression and anxiety, we found that only being a woman significantly increased the probability of developing depression and anxiety. This result is also in line with the literature.[33,34] We observed that factors such as education level, marital status, number of antiglaucoma drops used, previous ophthalmic operations have no effect on the incidence of depression or anxiety. Contrary to our results; according to the study of Maral et al., the rate of depression in single people with chronic illness was found to be higher than in married people.[35] These results vary considerably from society to society and the needs of the age in which the participants live, and different results may be obtained in different studies.

It is unclear whether beta-blockers increase depression susceptibility. While there are studies suggesting that oral beta-blockers used to treat hypertension increase the risk of depression in geriatric patients[12], Mabuchi et al. observed that topical beta-blocker eye drops are not associated with depression.[36] Our study supports these findings; when comparing patients with and without beta blocker drops in their treatment, we found no difference in depression and anxiety rates.

Previous studies indicate that advanced glaucoma increases the risk of developing depression.[37-39] In our study, no connection was found between the severity of glaucoma and the incidence of depression and anxiety. Depression and anxiety rates were found to be high in all groups compared to the prevalence of these two diseases.

This study has limitations. Firstly; we could not compare patients according to the type of antiglaucomatous drops they used; because there were too many combinations to be statistically comparable. Therefore, we classified patients only according to whether the topical antiglaucomatous drops they used contained beta-blockers or not, so we could not observe the effect of active substances on depression and anxiety. Secondly; We were unable to fill in a scale to examine the effects of glaucoma on patients' quality of life because more questions might reduce participants' compliance. Finally; patients in the glaucoma group were followed in our clinic for at least 1 year, and the time elapsed after glaucoma diagnosis was not homogeneous in the group and additionally all of our glaucoma patients were elderly, so they all had additional systemic conditions. Neurological and psychiatric diseases and medications were questioned regarding their impact on depression and anxiety results, but neither the glaucoma group nor the control group could be classified according to chronic diseases such as hypertension. This is an additional factor that restricts our work.

Consequently, although depression rates and the average BDI-II score were found to be high in patients with glaucoma in this study, depression and anxiety levels were not found to be statistically substantially higher. To better understand the association between glaucoma, depression, and anxiety, additional research using several kinds of depression and anxiety tests may be needed.

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Ethical approval: The study was approved by the Human Research Ethics Committee of Haydarpasa Numune Training and Research Hospital (HNEAH-KAEK 2023/KK46) and conducted in accordance with the Declaration of Helsinki.

Informed consent: Before inclusion, we obtained informed consent from all subjects.

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