



Perceived Stress Levels and Associated Factors in Adult Patients with Primary Open-angle Glaucoma: A Prospective Survey Study

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Purpose: To investigate adult primary open-angle glaucoma (POAG) patients' perceived stress levels and to examine the associations with their clinical characteristics.

Methods: Sixty-seven POAG patients, excluding those meeting the exclusion criteria (retinal or neurological disease diagnoses) comprised the study population. A validated questionnaire, namely Perceived Stress Scale-10 (PSS-10), was used to assess stress level. Additional data on glaucoma surgery history, medical benefit receipt, comorbidities, and daily antiglaucoma medication number were collected. The clinical characteristics of high (PSS-10 ≥ 15) and low stress (PSS-10 < 15) patients and the risk factors associated with high stress level were subjected to a multivariable logistic regression analysis.

Results: The patients were 56.8 ± 12.6 years of age on average, and 29 (43.3%) were female. The mean PSS-10 level was 13.5 ± 5.3 (range, 1–27) for the entire patient group; 31 patients (46.3%) were in the high stress group. In the high stress group relative to the low stress group, best-corrected visual acuity in the better eye was lower ($p = 0.044$) and the visual field defects, in both eyes, were more severe (better eye, $p = 0.005$; worse eye, $p = 0.026$). A logistic regression analysis indicated that severe visual field defect in the better eye (odds ratio, 1.159; 95% confidence interval, 1.016–1.323; $p = 0.028$) and lower best-corrected visual acuity in the better eye (odds ratio, 4.707; 95% confidence interval, 0.580–6.189; $p = 0.072$) were both likely to associated with high stress level in patients with POAG.

Conclusions: These findings suggest an association between severe visual function loss and higher mental stress level in POAG patients. Stress level, therefore, might be an important consideration in POAG patient management.

Key Words: Glaucoma, Open-angle glaucoma, Psychiatry, Surveys and questionnaires

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Glaucoma, a degenerative chronic optic neuropathy, is the second most common cause of blindness in the world [1]. Given its chronic nature and the possibility of its leading to irreversible blindness, not to mention the inherent side effects of its treatment, glaucoma often becomes psychologically burdensome for patients [2-4].

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Many studies have shown that anxiety, depression, or mental stress status can accelerate chronic disease courses. Stress, for example, exacerbates cardiovascular, gastrointestinal, or respiratory disorders [5-8]. Emotional responses to external stimuli trigger neurotransmitter secretion and, subsequently thereby, autonomic nervous system (ANS) stimulation, which impacts multiple organs [9]. The ANS, which also can be affected by stress level, might be implicated glaucoma development and/or progression. For patients with imbalanced ANS, for example, blood pressure fluctuation and hypotension tend to cause optic nerve blood-flow disorder or ischemia [10-13].

Few studies have investigated the association of mental stress with glaucoma [14-16]. The aim of the present study, then, was to measure adult primary open-angle glaucoma (POAG) patients' perceived stress levels using a validated questionnaire and to examine associations with their clinical characteristics.

Materials and Methods

Ethics statement

This single-center cross-sectional study was undertaken at Jeju National University Hospital. The study protocol was approved by the Institutional Review Board of Jeju National University Hospital (No. 2020-12-015) and adhered to the tenets of the Declaration of Helsinki. All participants provided their written informed consent.

Study subjects

For inclusion in the study, glaucoma patients were required to satisfy the following characterization of POAG: presence of glaucomatous optic disc changes manifesting as diffuse or localized notching, thinning, or both; retinal nerve fiber layer defect; glaucomatous visual field (VF) defect corresponding to structural change; and open angle (as confirmed by gonioscopic examination). Glaucomatous VF defect was defined as (1) glaucoma hemifield test values outside normal limits; (2) three or more abnormal contiguous points with probability of $p < 0.05$, of which one or more points has pattern deviation of $p < 0.01$; or (3) pattern standard deviation of $p < 0.05$. VF defects were confirmed based on two consecutive reliable tests (fixation loss rate,

$\leq 20\%$; false-positive and false-negative error rates, $\leq 25\%$). We excluded patients suspected of secondary glaucoma or angle-closure glaucoma. Subjects were further excluded if they had any retinal or neurologic disease that could possibly affect visual acuity or VF examination results.

All of the enrolled patients underwent an ophthalmological examination including best-corrected visual acuity (BCVA) assessment using the Snellen chart, slit-lamp biomicroscopy, dilated fundus examination, Goldmann applanation tonometry (Haag-Streit, Koniz, Switzerland), digital color stereo disc photography, red-free retinal nerve fiber layer photography, optical coherence tomography (OCT; Cirrus HD-OCT, Carl Zeiss Meditec, Dublin, CA, USA), and the SITA program test (central 24-2) of the Humphrey Visual Field (HFA 750i; Carl Zeiss Meditec).

Patients' treatment history regarding systemic disorders such as hypertension, diabetes mellitus, chronic diseases of the heart, lung or liver, autoimmune diseases, cancer, or psychiatric diseases was thoroughly investigated. We considered diseases included in the Charlson Comorbidity Index as possible comorbid conditions affecting perceived stress levels. The index included the following 16 categories of disease: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular accident or transient ischemic attack, dementia, chronic obstructive pulmonary disease, connective tissue disease, peptic ulcer disease, liver cirrhosis or chronic hepatitis, diabetes mellitus, hemiplegia, chronic kidney disease, solid tumor, leukemia, lymphoma, and AIDS [17]. In terms of diabetes mellitus, a poorly controlled condition defined as glycosylated hemoglobin $>7\%$ at the time of study enrollment was considered as a significant comorbidity [18]. The psychiatric diseases investigated in this study included the following: anxiety disorders, mood disorders, trauma-related and stressor-related disorders, feeding and eating disorders, disruptive impulse-control and conduct disorders, obsessive-compulsive and related disorders, as well as schizophrenia spectrum and other psychotic disorders [19].

Perceived stress questionnaire

Participants filled out Perceived Stress Scale-10 (PSS-10), a validated self-administered questionnaire, preparatory to assessment of their psychological stress. PSS-10 is a widely used, psychometrically validated and reliable measure of psychological stress [20]. PSS-10 includes 10 items, down

from the original 14 (PSS-14), four items (questions 4, 5, 12, and 13) having been removed owing to low factor relativity [21]. PSS-10 questions concern moods and thoughts experienced during the previous month, according to two factors: “general stressors” and “ability to cope.” Subjects were asked to indicate how often they found themselves in such situations [22].

In PSS-10, each item is measured on a Likert scale (0, never; 1, almost never; 2, sometimes; 3, fairly often; 4, very often), total scores ranging from 0 (no stress) to 40 (high stress). The score range is as follows: ≤ 14 , below or at average perceived stress; ≥ 15 , above average perceived stress [23]. The questionnaire was administered in a validated Korean version [24]. Participants completed the questionnaires at the clinic, or it was verbally administered to those lacking functional literacy and/or upon request. The full set of PSS-10 questions is listed in Table 1 and Supplementary Table 1.

Statistical analysis

Data are presented as mean \pm standard deviations, except stated otherwise. Parametric or nonparametric tests were used according to the normality of the data (as assessed by Kolmogorov-Smirnov testing). The independent *t*-test and chi-square test for independent samples were used in order to assess the differences between the high and low stress groups. Logistic regression analyses were performed to identify clinical characteristics associated with high-level stress. Factors with a *p*-value of < 0.10 as

determined in the univariate model were included in the multivariate model. A *p*-value of < 0.05 indicated statistical significance. All of the statistical analyses were performed with IBM SPSS ver. 27.0 (IBM Corp., Armonk, NY, USA). As a sensitivity analysis, we repeated the earlier analyses by excluding patients with surgical history.

Results

Initially, 68 POAG patients who had met the eligibility criteria were enrolled. Among them, one withdrew their consent to participate. Thus, the final cohort number was 67.

Demographic and clinical characteristics of study subjects

The subjects' mean age was 56.8 ± 12.6 years (range, 22–77 years). Among them, 38 (56.7%) were male and 29 (43.3%) were female. The majority of patients ($n = 57$, 85.1%) were cases of bilateral glaucoma involvement, 10 (14.9%) being unilateral. Most patients ($n = 61$, 91.0%) had a baseline intraocular pressure (IOP) lower than 21 mmHg. The average VF mean deviation was, in the better eye, -5.5 ± 6.5 dB, and in the worse eye, -9.9 ± 8.1 dB. A total of five patients (7.5%) had severe visual impairment ($< 6 / 60$) in their better eye. Three had advanced VF defect, and the other two both had center-involving VF defect with moderate cortical cataract. The mean PSS-10 for the entire patient group was 13.5 ± 5.3 (range, 1–27). The patients' de-

Table 1. Perceived Stress Scale-10

No.	Question
1.	In the last month, how often have you been upset because of something that happened unexpectedly?
2.	In the last month, how often have you felt that you were unable to control the important things in your life?
3.	In the last month, how often have you felt nervous and “stressed”?
4.	In the last month, how often have you felt confident about your ability to handle your personal problems?
5.	In the last month, how often have you felt that things were going your way?
6.	In the last month, how often have you found that you could not cope with all the things that you had to do?
7.	In the last month, how often have you been able to control irritations in your life?
8.	In the last month, how often have you felt that you were on top of things?
9.	In the last month, how often have you been angered because of things that were outside of your control?
10.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Each item was measured on a Likert scale (0, never; 1, almost never; 2, sometimes; 3, fairly often; 4, very often), total scores ranging from 0 (no stress) to 40 (high stress). The corresponding Korean version is provided in Supplementary Table 1.

mographic and clinical characteristics are summarized in Table 2.

Demographic and clinical characteristics of low and high stress POAG patients

Among the 67 POAG patients, 36 (53.7%) were in the low stress group (PSS-10 range, 1–14) and 31 (46.3%) were in the high stress group (PSS-10 range, 15–27). Compared with the low stress group, the high stress group had a lower BCVA (logarithm of the minimum angle of resolution, logMAR) in the better eye (0.04 ± 0.05 vs. 0.14 ± 0.20 logMAR, $p = 0.044$) and more severe VF defects, both in the better eye (-3.48 ± 2.95 vs. -8.21 ± 8.46 dB, $p = 0.005$), and in the worse eye (-7.74 ± 6.26 vs. -12.30 ± 9.38 dB, $p = 0.026$).

In the low stress group, one patient had undergone glaucoma surgery, two had received medical benefits, and 13 suffered underlying diseases. In the high stress group, three patients had undergone glaucoma surgery, one had received medical benefits, and 12 patients were afflicted with underlying diseases. None of these intergroup differences were statistically significant ($p = 0.235$, $p = 0.468$, and $p > 0.999$, respectively). The number of IOP-lowering eye drops taken per day was higher in the high stress

group, but the difference was not statistically significant (3.7 ± 2.3 vs. 4.3 ± 2.8 , $p = 0.439$). One patient diagnosed with schizophrenia was included in the low stress group, and the high stress group included one patient with panic disorder and one with depression. The overall results of the intergroup comparison by PSS-10 are summarized in Table 3.

Factors associated with high perceived stress in POAG patients

The factors found to be associated with high perceived stress level were analyzed by both univariable and multivariable analyses. The univariable analysis revealed that male sex (odds ratio [OR], 2.347; 95% confidence interval [CI], 0.856–6.369; $p = 0.094$), lower BCVA in better eye (per 0.1 logMAR worse; OR, 8.454; 95% CI, 2.260–31.63; $p = 0.026$), worse VF defect in better eye (OR, 1.178; 95% CI, 1.038–1.337; $p = 0.011$), and worse VF defect in worse eye (OR, 1.079; 95% CI, 1.008–1.155; $p = 0.028$) were associated with high stress level.

According to the multivariable logistic regression analysis, worse VF defect in better eye was associated with high-stress risk in POAG patients (OR, 1.159; 95% CI, 1.016–1.323; $p = 0.028$). Lower BCVA in better eye also was likely to be associated with high-stress risk (OR, 4.707; 95% CI, 0.580–6.189; $p = 0.072$). The full statistical results with the ORs and CIs are summarized in Table 4.

As a sensitivity analysis, we repeated the analyses by excluding four patients (6.0%) who had undergone glaucoma surgery. We noted that, after accounting for the effects of surgical history, the conclusions were not altered substantially. The results are shown in Supplementary Table 2.

Discussion

This study investigated adult POAG patients' perceived stress levels and revealed the clinical risk factors that are associated with high stress level. We found that worse VF defect and lower BCVA in the better eye are likely to be associated with high mental stress.

The relationship between glaucoma patients' VF loss and quality of life (QoL) has been investigated previously. The Los Angeles Latino Eye Study, a population-based prevalence study on eye diseases, reported that glaucoma patients who had severe VF loss scored lower on QoL than

Table 2. Clinical characteristics of study patients (n = 67)

Characteristic	Value
Age (yr)	56.8 ± 12.6 (32 to 77)
Sex	
Male	38 (56.7)
Female	29 (43.3)
BCVA (logMAR)	
Better eye	0.09 ± 0.15 (0 to 0.70)
Worse eye	0.23 ± 0.36 (0 to 1.10)
Intraocular pressure (mmHg)	
Right eye	12.5 ± 2.8 (7.0 to 20.0)
Left eye	12.2 ± 3.1 (6.0 to 20.0)
Visual field mean deviation (dB)	
Better eye	-5.50 ± 6.50 (-30.28 to 0.56)
Worse eye	-9.90 ± 8.10 (-33.06 to -0.82)
Perceived Stress Scale-10	13.5 ± 5.3 (1 to 27)

Values are presented as mean ± standard deviation (range) or number (%).

BCVA = best-corrected visual acuity; logMAR = logarithm of the minimum angle of resolution.

did patients with no or mild VF loss [25]. Wolfram et al. [26] evaluated POAG patients' general and visual function QoL and found that QoL perception was progressively reduced throughout the disease stages. QoL is defined as an individual's perception of his or her position in life, both within the context of their culture and value systems and in relation to their goals, expectations, standards, stress, and concerns [27]. Severe VF damage, for example, has a negative impact on daily activities such as driving, walking or reading. It can be considered, therefore, that severe VF loss affects general and/or visual function QoL for glaucoma patients, resulting in high stress levels.

Our study did not evaluate the impact of binocularity or VF-defect location on perceived stress levels. In the study of van Gestel et al. [28], which investigated the relationship between VF loss and health-related QoL in glaucoma patients, binocular VF was almost completely determined by the VF in the better eye. This study also showed the major impact of the better eye in vision-related activities and visual functioning, which was consistent with our findings. However, monocular VF cannot fully reflect the binocular VF in individual patients. Definitely, future research on the relationship between binocular VF and perceived stress is needed.

Table 3. Comparison of demographic and clinical characteristics between low and high stress group

Variable	Low stress (n = 36)	High stress (n = 31)	p-value
Baseline factor			
Age (yr)	56.5 ± 13.1 (35 to 77)	57.2 ± 12.1 (32 to 75)	0.816*
Sex			
Male	17 (47.2)	21 (67.7)	
Female	19 (52.8)	10 (32.3)	0.091†
Medical benefit recipient	2 (5.6)	1 (3.2)	0.468‡
Ocular factor			
BCVA (logMAR)			
Better eye	0.04 ± 0.05 (0 to 0.22)	0.14 ± 0.2 (0 to 0.70)	0.044§
Worse eye	0.14 ± 0.16 (0 to 0.82)	0.33 ± 0.4 (0 to 1.10)	0.145§
Visual field mean deviation (dB)			
Better eye	-3.48 ± 2.95 (-11.46 to 0.56)	-8.21 ± 8.46 (-30.28 to 0.55)	0.005*
Worse eye	-7.74 ± 6.26 (-28.90 to -1.05)	-12.30 ± 9.38 (-33.06 to -0.81)	0.026*
Intraocular pressure (mmHg)			
Right eye	12.4 ± 2.7 (10.0 to 20.0)	12.5 ± 3.1 (7.0 to 19.0)	0.855*
Left eye	12.1 ± 2.9 (6.0 to 19.0)	12.3 ± 3.4 (8.0 to 20.0)	0.789*
History of glaucoma surgery	1 (2.8)	3 (9.7)	0.235‡
No. of eye drops per day	3.7 ± 2.3 (1 to 10)	4.3 ± 2.8 (1 to 10)	0.439§
Comorbidity			
Uncontrolled diabetes mellitus	3 (8.3)	3 (9.7)	
Cerebrovascular accident	1 (2.8)	0 (0)	
Heart disease	3 (8.3)	2 (6.5)	
Lung disease	2 (5.6)	1 (3.2)	
Liver disease	1 (2.8)	1 (3.2)	
Cancer	2 (5.6)	3 (9.7)	
Psychiatric disease	1 (2.8)	2 (6.5)	

Values are presented as mean ± standard deviation (range) or number (%).

BCVA = best-corrected visual acuity; logMAR = logarithm of the minimum angle of resolution.

*Independent *t*-test; †Chi-square test; ‡Fisher exact test; §Mann-Whitney *U*-test.

Table 4. Factors associated with high perceived stress in patients with glaucoma

Variable	Univariable analysis		Multivariable analysis	
	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value
Age (yr)	1.005 (0.967–1.044)	0.813	-	-
Female sex	0.426 (0.157–1.155)	0.094	0.566 (0.189–1.692)	0.308
BCVA (better eye)*	8.454 (2.260–31.63)	0.026	4.707 (0.580–6.189)	0.072
Visual field mean deviation†				
Better eye	1.178 (1.038–1.346)	0.011	1.159 (1.016–1.323)	0.028
Worse eye	1.079 (1.008–1.155)	0.028	0.988 (0.890–1.095)	0.818
History of glaucoma surgery	3.750 (0.370–8.048)	0.264	-	-
Medical benefit recipients	2.414 (0.208–7.983)	0.481	-	-
Comorbidity	1.117 (0.414–3.014)	0.826	-	-
No. of eye drops per day	1.095 (0.907–1.323)	0.345	-	-

OR = odds ratio; CI = confidence interval; BVCA = best-corrected visual acuity.

*Per 0.1 logarithm of the minimum angle of resolution worse; †Per decibel worse.

Both objective and subjective visual impairments are associated with higher perceived stress levels [29]. Visual impairment can directly increase levels of perceived stress by limiting an individual's ability to engage in daily activities (e.g., mobility, driving, reading, and recognizing people). Such limitations may reduce social interactions, leading to loneliness [30], which is perceived by many as being stressful [31]. Anxiety or fear of becoming blind, moreover, may lead to high stress levels in patients with poor vision [32]. Our study results also indicated that lower BCVA in the better eye was likely to be associated with high levels of stress, though this conclusion did not meet the threshold for statistical significance ($p = 0.072$). In our logistic regression analysis, notably, greater decrease in BCVA in the better eye showed a higher OR for high-stress risk compared with that of worse VF mean deviation (4.707 and 1.159, respectively). In a study by Richman et al. [33], an objective estimation of vision-specific ability to perform activities of daily living and its correlation to clinical tests was attempted for a group of glaucoma patients. In this study, binocular visual acuity had, as compared with Esterman binocular VF, higher correlations with patients' ability to perform daily-life actions such as reading in reduced illumination or recognizing facial expressions [33]. These results suggest the possibility that vision is a more important factor in determining visual function QoL and subsequent perceived stress level. However, since advanced VF defects and center-involving defects also can affect vision, the interaction between these two factors should be

thoroughly investigated. Also, as our cohort included only a small number of patients ($n = 5$, 7.5%) with severe visual impairment ($<6 / 60$), further, larger-sample studies with a wider range of visual acuity are warranted.

Alternatively, it is also possible that stress contributes to glaucoma development and/or deterioration. Stress may in fact be a risk factor for increased cortisol levels, which could negatively impact the brain and eye via ANS imbalance and/or vascular dysregulation [34]. The negative effect of mental stress on treatment adherence, specifically in chronic diseases such as type 2 diabetes mellitus and hypertension, has been reported [35, 36]. Pappa et al. [37] showed psychological distress to be associated with glaucoma patients' poor treatment compliance. Although the specific impact of noncompliance on clinical outcome still is not well established [38], several studies have found a relation between noncompliance and either high IOP or severe VF loss [39–41]. Stress, furthermore, may lead to unhealthy behavior such as smoking, excessive alcohol consumption, and poor eating habits, which can lead to increased risk of development, or exacerbation, of glaucomatous damage [42,43]. Hence, there may be a vicious cycle wherein glaucoma leads to increased levels of stress, which in turn, aggravates glaucomatous damage, leading to further increased stress levels, and so on.

It has been known that susceptibility to stress and coping styles differ according to sex. Women tend to rate their life events as more negative and less controllable than men [44]. Cohen et al. [45], having analyzed national surveys

done more than two decades apart, showed that women consistently reported more stress than did men. A study that evaluated perceived stress levels in uveitis patients correspondingly reported female sex as a significant factor for high PSS-10 score [46]. In our univariate analysis results, male sex tended to show higher stress. Notably, male patients in our study had worse BCVA (0.12 ± 0.19 vs. 0.05 ± 0.06 logMAR) and VF mean deviation (-6.84 ± 7.93 vs. -3.80 ± 3.20) in their better eye relative to female patients, though the differences did not reach statistical significance (both $p > 0.05$). Thus, this visual function loss would have had a greater influence on male patients' high PSS-10 score than sex-based differences in susceptibility to stress.

The present study's findings should be interpreted in the context of its limitations. First, its design is cross-sectional, and the questionnaire utilized is subject to recall bias. PSS consists of questions that refer to the month prior to the questionnaire, and so, reflecting all aspects of a patient's stress is not possible. In future research, a longitudinal study design would enable better characterization of the association between stress level and glaucomatous damage in patients with POAG. Second, we were not able to evaluate some factors possibly associated with mental stress level, such as living arrangement, smoking status, and personality traits. A more complex measure would have allowed for more detailed statistical analyses of risk factors for high stress level in POAG patients. Third, the enrolled subjects were mostly low-baseline-IOP POAG (91.0% of the subjects had a baseline IOP ≤ 21 mmHg). Therefore, given that higher IOP levels may be a significant stressor, our results might not be directly applicable to higher-baseline-IOP POAG patients. Fourth, this study did not exclude patients with psychiatric diseases. Acute and chronic stressors play a role in the pathogenesis of numerous psychiatric diseases as well as in the exacerbation of symptoms [47]. Individuals with psychiatric diseases may selectively recall more negative or stressful events that had occurred in the past, resulting in a high or relatively high PSS-10 score. Fifth, the effects of confounding variables could have been exacerbated in the present analysis due to its having included only a modest sample size. Also, our patients were volunteers who had agreed to participate in this study. Therefore, selection bias cannot be ruled out.

In conclusion, this study suggests that severe visual function loss is associated with higher levels of mental stress for POAG patients. This finding offers new insights

into the best care of patients with glaucoma. The causal interactions possibly at work between stress and glaucoma need to be addressed by future longitudinal studies.

Conflicts of Interest: None.

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Supplementary Materials

Supplementary Table 1. Korean version of Perceived Stress Scale-10

Supplementary Table 2. Factors associated with high perceived stress in patients with glaucoma

Supplementary materials are available at <https://doi.org/10.334/kjo.2022.0049>.

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Supplementary Table 1. Korean version of Perceived Stress Scale-10

No.	Question
1.	최근 1개월 동안, 예상치 못했던 일 때문에 당황했던 적이 얼마나 자주 있었습니까?
2.	최근 1개월 동안, 인생에서 중요한 일들을 조절할 수 없다는 느낌을 얼마나 경험하였습니까?
3.	최근 1개월 동안, 신경이 예민해지고 스트레스를 받고 있다는 느낌을 얼마나 경험하였습니까?
4.	최근 1개월 동안, 당신의 개인적 문제들을 다루는데 있어서 얼마나 자주 자신감을 느끼셨습니까?
5.	최근 1개월 동안, 일상의 일들이 당신의 생각대로 진행되고 있다는 느낌을 얼마나 경험하였습니까?
6.	최근 1개월 동안, 당신이 꼭 해야 하는 일을 처리할 수 없다고 생각한 적이 얼마나 있었습니까?
7.	최근 1개월 동안, 일상생활의 짜증을 얼마나 자주 잘 다스릴 수 있었습니까?
8.	최근 1개월 동안, 최상의 컨디션이라고 얼마나 자주 느끼셨습니까?
9.	최근 1개월 동안, 당신이 통제할 수 없는 일 때문에 화가 난 경험이 얼마나 있었습니까?
10.	최근 1개월 동안, 어려운 일들이 너무 많이 쌓여서 극복 하지 못할 것 같은 느낌을 얼마나 자주 경험하셨습니까?

Supplementary Table 2. Factors associated with high perceived stress in patients with glaucoma

Variable	Univariable analysis		Multivariable analysis	
	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value
Age (yr)	1.012 (0.971–1.055)	0.573		
Female sex	0.399 (0.142–1.123)	0.082	0.574 (0.190–1.740)	0.327
BCVA (better eye)*	2.243 (0.790–38.905)	0.061	4.175 (0.205–6.819)	0.085
Visual field mean deviation				
Better eye	1.172 (1.026–1.339)	0.020	1.172 (1.026–1.339)	0.020
Worse eye	1.079 (1.005–1.159)	0.037	0.996 (0.894–1.110)	0.946
Medical benefit recipient	1.259 (0.075–2.107)	0.873	-	-
Comorbidity	1.269 (0.460–3.502)	0.645	-	-
No. of eye drops per day	1.066 (0.875–1.300)	0.525	-	-

OR = odds ratio; CI = confidence interval; BVCA = best-corrected visual acuity.

*Per 0.1 logarithm of the minimum angle of resolution worse; †Per decibel worse.