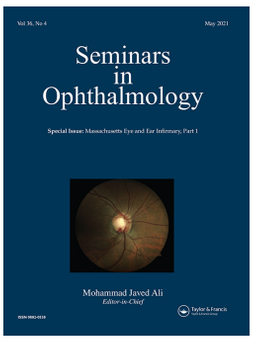

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Quality of Life among Patients with Retinal Vein Occlusion: A Case-Control Study

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ABSTRACT

Purpose: The purpose of this study was to evaluate health-related quality of life in patients with retinal vein occlusion (RVO) and investigate the possible risk factors for poor quality of life in patients with RVO.
Methods: Participants in the study were 67 patients with RVO, 42 male and 25 female, mean-aged 73.1 ± 10.9 years, and 70 sex- and age-matched controls. Demographic data, lifestyle factors and medical history were recorded. All patients underwent best-corrected visual acuity measurement, dilated fundoscopy and optical coherence tomography. All participants completed two questionnaires assessing quality of life (EQ-5D, NEI VFQ-25). Risk factors for health-related quality of life in RVO patients were investigated.
Results: Patients with RVO exhibited significantly lower composite score for VFQ-25 compared to controls (74.1 ± 3.8 vs. 91.7 ± 3.9 for patients and controls, respectively, $p < .001$). In addition, RVO patients had significantly lower EQ-5D Index score compared to controls (0.88 ± 0.15 vs. 0.92 ± 0.12 for patients and controls, respectively, $p = .043$). Risk factors associated with quality of life in patients with RVO were found the alcohol consumption, the presence of thyroidopathy, coagulation disorders, visual acuity in the eye with RVO, central retinal thickness, the type of edema, the presence of ischemia and the condition of external limiting membrane. In multivariate analysis, only alcohol consumption and visual acuity in the eye with RVO were found to be independent risk factors, affecting quality of life in RVO patients.
Conclusions: Patients with RVO presented lower quality of life in comparison with controls. Potential risk factors should be taken into account and their early detection may improve quality of life in such patients and lead to targeted health policies.

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Retinal vein occlusion; quality; VFQ-25; EQ-5D; risk factors

INTRODUCTION

Retinal vein occlusion (RVO) is the most common retinal vascular disorder after diabetic retinopathy and is considered to be an important cause of visual loss.[1,2] RVO is broadly classified into central RVO (CRVO) when the central retinal vein is occluded, and branch RVO (BRVO), when any of the branches of the central retinal vein is affected, with the latter reported to be 3 times more common than CRVO.[1,2] The incidence of RVO increases with age, while there is no gender predilection.[3]

Various cardiovascular, thrombophilic, systemic and ocular conditions have been reported to predispose individuals to the development of RVO. The most common risk factors associated with RVO include hypertension, atherosclerosis, hyperlipidemia, diabetes mellitus, smoking, obesity, hyperhomocysteinemia, hypercoagulability, age >65 years, open-angle glaucoma and ocular inflammatory diseases.[4,5] Macular edema and retinal ischemia are the most common causes of visual loss in patients with RVO,[6,7] which preclude affected individuals from performing their daily activities and sometimes leading to emotional stress and depression.[8]

Vision-related quality of life has been previously assessed in patients with cataract, glaucoma, age-related macular degeneration, diabetic retinopathy, and other ocular diseases, using several instruments, the most common of which is the National Eye Institute Visual Function Questionnaire-25 (VFQ-25).[9–16] Additionally, other generic questionnaires, such as the EuroQoL-5D (EQ-5D), have been found to be suitable to evaluate health status and function in both patients with various problems and healthy individuals. However, it has been reported that these questionnaires are not sufficiently sensitive to address problems caused by visual impairment.[17]

Very few studies have assessed vision-related quality of life in patients with RVO, either before or after the appropriate treatment, using the VFQ-25.[8,18–21] Moreover, these studies did not evaluate factors, affecting the quality of life in patients with RVO. In light of the above, the purpose of the present study was to evaluate the quality of life in RVO patients and compare it with that of healthy controls. In addition, our study aimed to investigate possible risk factors for poor quality of life in patients with RVO.

MATERIALS AND METHODS

Participants included 67 patients with RVO, 39 with CRVO and 28 with BRVO, who were recruited at the Retina Department, 2nd Department of Ophthalmology, University of Athens, Athens, Greece. Individuals with corneal abnormalities, retinal diseases other than RVO, glaucoma, ocular

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trauma, retinal detachment, ocular inflammation or infection and psychiatric diseases were excluded. In addition, 70 age- and sex-matched controls without RVO or other ocular disease related to the above-mentioned exclusion criteria were also enrolled in the study. All procedures were in accordance with the Tenets of the Declaration of Helsinki and were approved by the Institutional Review Board of the participating hospital. Written informed consent was provided by all patients.

Demographic (age, sex, marital status and education level) and lifestyle data (smoking, alcohol consumption, exercise), medical history and comorbidities (hypertension, diabetes mellitus, thyroidopathy, cardiovascular diseases, coagulation disorders) were recorded.

All participants underwent a thorough ophthalmological examination, including best-corrected visual acuity (BCVA) measurement, slit-lamp biomicroscopy, dilated fundus examination, spectral domain-optical coherence tomography (SD-OCT) and fundus fluorescein angiography (FFA). The BCVA was measured using a standard Snellen chart, but was converted in logMAR scale for statistical analysis. SD-OCT and FFA were performed using Spectralis (Spectralis, Heidelberg Engineering, Heidelberg, Germany) in all participants after adequate dilation with 1% Tropicamide and 2.5% Phenylephrine. The scanning area covered 6 × 6 mm and macular cube 512 × 128 scans were performed, while 6 final figures were obtained and analyzed by two experienced ophthalmologists. Central retinal thickness (CRT) was measured in all patients. The type of macular edema (cystoid or diffuse), the presence of ischemia and the condition of the ellipsoid zone (EZ) and external limiting membrane (ELM) were also assessed.

All participants completed the VFQ-25 questionnaire to assess their functional vision. The VFQ-25 measures the following vision-dependent sub-scales: general health (GH), general vision (GV), ocular pain (OP), near activities (NA), distance activities (DA), vision-specific social functioning (VSSF), mental health (VSMH), role difficulties (VSRD), dependency (VSD), driving (D), colour vision (CV) and peripheral vision (PV). The subscales score ranged from 0 to 100. A score of 0 indicated the worst possible score and a score of 100 the best possible score. Then the subscales were recorded and scored, as appropriate.[9,16] The authors have used the official Greek translation of the VFQ-25 by the Laboratory of Experimental Ophthalmology of Aristotle University, Thessaloniki, Greece, 2000,[16] while the questionnaire has been validated for the Greek population.[22]

In addition, all participants completed the EQ-5D questionnaire, which comprises a five-dimension health descriptive system, namely mobility, self-care, usual activities, pain/discomfort and anxiety/depression, in which respondents are asked to rate their health problems at three levels: none-moderate-extreme, which are coded 1, 2 or 3, respectively. A five-digit sequence therefore describes the respondent's health state across these dimensions. An index utility score can be derived from the responses in the five dimensions, ranging from −0.59 for the worst possible health state to 1.00 for perfect health.[23] For the current study, the UK algorithm was used for calculating the EQ-5D utility score.[24] The EQ-5D questionnaire also contains a vertical visual analog scale (EQ-VAS) with the number "100" (best imaginable health state) at the top and "0" (worst imaginable health state) at the bottom of the scale.[23,24] It has to be noted that this questionnaire has been validated for the Greek population.[23]

Statistical Analysis

The deviation from normality was assessed using the Kolmogorov-Smirnov test. For comparisons between patients with RVO and controls, the Student's t-test or Mann-Whitney-Wilcoxon test for independent samples for continuous variables and chi-squared test for categorical variables were implemented, while multivariate logistic regression analysis using the backward-selection stepwise model was performed to assess factors potentially related to RVO appearance.

For the evaluation of the factors possibly associated with the various questionnaires' sub-scales, a univariate analysis was performed. The Student's t-test or Pearson's correlation coefficient was appropriately implemented when subscales were normally distributed. On the other hand, in case of significant deviation from normality, non-parametric tests (Mann-Whitney-Wilcoxon test for independent samples or Spearman's rank correlation coefficient) were appropriately performed. The chi-squared test was used for categorical variables. Given the problem of multiplicity in statistical testing, the results of the univariate analysis should not be interpreted as confirmatory but purely hypotheses-generating. In the multivariate logistic regression analysis, only factors demonstrating statistical significance ($p < .05$) in the univariate analysis were tested in the stepwise multivariate model as independent variables; in the final model, only the statistically significant variables were retained (i.e., backward-selection statistical procedure). The level of statistical significance was set to 0.05. Statistical analysis was performed using SPSS version 25.0 statistical software (IBM Corporation, Armonk, NY, USA).

RESULTS

Table 1 shows the demographic, lifestyle and clinical data of the study sample. The mean (± SD) age of patients was 73.1 ± 10.9 years, and the mean (± SD) age of controls was 73.2 ± 9.6 years. 62.7% of patients were male and 37.3% were female, while 58.6% of controls were male and 41.4% were female. Patients with RVO appeared to have a higher education level (university) than controls ($p < .001$), be smokers in a higher percentage than controls ($p < .001$) and did not exercise compared with controls ($p < .001$). In addition, there was a statistically significant difference in the presence of hypertension ($p = .003$), dyslipidemia ($p < .001$), thyroidopathy ($p < .001$), cardiovascular disorders ($p = .005$) and coagulation disorders ($p = .013$) between patients with RVO and controls. There was no statistically significant difference between patients and controls regarding age ($p = .884$), sex ($p = .727$), marital status ($p > .999$), alcohol consumption ($p = .960$) and presence of diabetes mellitus ($p = .064$). Multivariate logistic regression analysis revealed that higher education status ($p < .001$), smoking ($p < .001$), lack of exercise ($p < .001$), dyslipidemia ($p = .010$) and thyroidopathy ($p = .008$) were

Table 1. Demographic and clinical data of our study sample.

	Patients (n = 67)	Controls (n = 70)	P-value
	Mean±SD (range)		
Age (years)	73.1 ± 10.9	73.2 ± 9.6	.884
RVO eye BCVA (decimal)	0.29 ± 0.18	0.92 ± 0.09	**<.001**
Fellow eye BCVA (decimal)	0.91 ± 0.16	0.96 ± 0.06	.868
Central retinal thickness (μm)	505.4 ± 188.0	247.9 ± 20.4	**<.001**
	N (%)		
Gender	42 (62.7)	41 (58.6)	.727
Male	25 (37.3)	29 (41.4)	
Female			
Marital status	47 (70.1)	49 (70)	>.999
Married	20 (29.9)	21 (30)	
Single/Divorced/Widowed			
Educational status	29 (43.3)	61 (87.1)	**<.001**
Secondary	38 (56.7)	9 (12.9)	
High/University			
Smoking (Yes)	41 (61.2)	14 (20)	**<.001**
Alcohol consumption (Yes)	29 (43.3)	30 (42.9)	.960
Exercise	46 (68.7)	26 (37.1)	**<.001**
No	21 (31.3)	44 (62.9)	
Mild/Moderate			
Hypertension (Yes)	46 (68.7)	30 (42.9)	**.003**
Diabetes mellitus (Yes)	10 (14.9)	20 (28.6)	.064
Dyslipidaemia (Yes)	26 (38.8)	7 (10.0)	**<.001**
Thyroidopathy (Yes)	21 (31.3)	3 (4.3)	**<.001**
Cardiovascular disorders (Yes)	14 (20.9)	7 (10)	**.005**
Coagulation disorders (Yes)	8 (11.9)	3 (4.3)	**.013**

BCVA: best corrected visual acuity; RVO: retinal vein occlusion.

Table 2. Results of the multivariate logistic regression analysis, examining factors associated with retinal vein occlusion.

	Category/Increment	Odds ratio (95%CI)	p-Value
Educational level	University vs. Secondary school	11.31 (3.64–35.13)	**<.001**
Smoking	Yes vs. No	28.35 (6.51–123.24)	**<.001**
Exercise	Mild/Moderate vs. No	0.07 (0.02–0.29)	**<.001**
Dyslipidaemia	Yes vs. No	5.51 (1.51–20.09)	**.010**
Thyroidopathy	Yes vs. No	9.47 (1.79–50.00)	**.008**

independently associated with the presence of RVO presence, as it is shown in Table 2.

The VFQ-25 sub-scales scores of patients with RVO are summarized in Table 3. The sub-scales, that exhibited the lowest scores, were GV (49.6 ± 11.2), DA (50.9 ± 12.2), GH (58.6 ± 17.2) and NA (59.0 ± 10.4). In contrast, CV sub-scale (100.0 ± 0.0) was unaffected, while VSSF (99.6 ± 2.1) was only slightly affected. The remaining sub-scales (VSMH, VSRD, VSD, D, PV, OP) were moderately affected. The composite score for RVO patients was equal to 74.1 ± 3.8. Patients with RVO exhibited significantly lower scores in comparison with healthy controls, regarding GV (p < .001), OP (p = .040), NA (p < .001), DA (p < .001), VSSF (p < .001), VSRD (p = .028), VSD (p < .001), D (p < .001), VSMH (p < .001) and composite score of VFQ-25 (p < .001). The internal consistency of the VFQ-25 in our study sample as measured by Cronbach's alpha was 0.853, thus demonstrating high internal consistency.

Table 3. Results of the VFQ-25 questionnaire.

	Patients with RVO (n = 67)		Controls (n = 70)		
VFQ-25 Sub-scale	mean±SD	Range	mean±SD	Range	p-Value*
General Health	58.6 ± 17.2	0–100	64.6 ± 19.7	25–100	.064
General Vision	49.6 ± 11.2	20–80	85.1 ± 11.6	60–100	**<.001**
Ocular Pain	87.3 ± 4.1	75–100	88.9 ± 5.0	75–100	**.040**
Near Activities	59.0 ± 10.4	41.7–91.7	96.7 ± 9.3	50–100	**<.001**
Distance Activities	50.9 ± 12.2	25–83.3	97.5 ± 5.9	66.7–100	**<.001**
Color Vision	100.0 ± 0.0	100	99.8 ± 1.5	87.5–100	.328
Peripheral Vision	73.5 ± 6.0	50–75	75.9 ± 10.1	62.5–100	.086
Social Functioning	91.6 ± 6.3	87.5–100	99.6 ± 2.1	75–100	**<.001**
Role difficulties	77.4 ± 6.8	66.7–91.7	82.3 ± 10.8	66.7–100	**.028**
Dependency	73.5 ± 10.0	50–100	82.3 ± 10.8	66.7–100	**<.001**
Driving	71.2 ± 13.1	50–100	100 ± 0	100	**<.001**
Mental Health	70.3 ± 6.5	56.3–87.5	99.3 ± 4.2	75–100	**<.001**
Composite score	74.1 ± 3.8	63.8–84.5	91.7 ± 3.9	80.2–100	**<.001**

Table 4. EQ-5D subscales between patients with retinal vein occlusion and controls.

	No problem		Some problems		Major problems		
	Patients	Controls	Patients	Controls	Patients	Controls	*P*-value
	N (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	*N* (%)	
Mobility	54 (80.6%)	66 (94.3%)	13 (19.4%)	4 (5.7%)	0	0	**.019***
Self-care	52 (77.6%)	70 (100%)	15 (22.4%)	0	0	0	**<.001***
Usual activities	44 (65.7%)	69 (98.6%)	23 (34.3%)	1 (1.4%)	0	0	**<.001***
Pain	63 (94%)	62 (88.6%)	4 (6%)	8 (11.4%)	0	0	.367*
Anxiety/depression	62(92.5%)	56 (80%)	4 (6%)	13 (18.6%)	1 (1.5%)	1 (1.4%)	.072*
		Patients Mean±SD			**Controls Mean±SD**		
EQ-5D VAS		80.0 ± 9.3			80.5 ± 10.1		.700**
EQ-5D Index		0.88 ± 0.15			0.92 ± 0.12		**.043****

The EQ-5D sub-scales scores of patients with RVO are shown in Table 4. There was a statistically significant difference between patients with RVO and controls in EQ-5D scores, regarding mobility (p = .019), self-care (p < .001), usual activities (p < .001) and EQ-5D utility score index (p = .043), while EQ-VAS did not differ between the groups (p = .700).

The composite VFQ-25 questionnaire score was not correlated with EQ-5D VAS score (Spearman's rho = −0.020, p = .815) nor with EQ-5D utility score index (Spearman's rho = +0.063, p = .464).

Table 5 summarizes the results of the univariate analysis, examining potential demographic, lifestyle and medical history risk factors for poor quality of life in RVO patients. Low VFQ-25 composite score was associated with alcohol consumption (p = .019), hypertension (p = .026), thyroidopathy (p = .024), cystoid type of macular edema (p = .027), presence of ischemia (p = .017), disruption of ellipsoid zone (p = .004), disruption of external limiting membrane (p = .009), higher CRT (p = .002) and lower BCVA (p = .021). In the multivariate logistic regression analysis examining factors associated with poorer VFQ-25 composite score, only alcohol consumption (p = .034) and visual acuity (p = .017) were found to be significant (Table 6). EQ-5D index score was associated with coagulation disorders (p < .001). In this case, because only one variable was proven significant, no multivariate analysis was performed.

DISCUSSION

Principal findings of the present study suggest that vision- and health-related quality of life in patients with RVO appeared to be affected by alcohol consumption, coagulation disorders and visual acuity. To our knowledge, this is the first investigation to examine potential factors affecting the quality of life in patients with RVO. It is noteworthy that the VFQ-25 composite score did not highlight significant predictors, except for alcohol consumption and visual acuity, while ophthalmological data were not associated with the generic questionnaire scales, i.e.,, EQ-5D VAS and EQ-5D utility score index. This finding suggests that more specific questionnaires seemed to be better than generic surveys, to evaluate health-related quality of life in individuals with ophthalmic disorders.

Our results also demonstrated that patients with RVO exhibited lower scores in basic sub-scales of the questionnaires and therefore poorer quality of life compared with controls. Regarding the generic questionnaire, no study to date has evaluated the EQ-5D questionnaire in RVO patients, while our results revealed significantly lower EQ-5D index scores between patients with RVO and controls. Regarding the specific VFQ-25 questionnaire, previous studies have also reported that patients with RVO demonstrated reduced scores in VFQ-25 questionnaire sub-scales and composite score compared to reference populations with normal vision,[8,20] while no difference was noticed in VFQ-25 questionnaire score between RVO patients and those with diabetic retinopathy.[8] In the multicenter Standard Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE) study, the mean VFQ-25 composite score in RVO patients was found to be approximately 77,[20] similar to our VFQ-25 composite score results (approximately 74).

Analyzing the numerical values of the VFQ-25 sub-scales, the most affected sub-scales were general vision, distance and near activities, and general health. This may reflect the limitations that RVO imposes on visual acuity, both in terms of near and distance vision. On the other hand, VSMH, role difficulties and dependency were moderately affected, which may entail the nature of the specific VFQ-25 items. For instance, despite the difficulties encountered in daily activities, it would be difficult to conceive of a patient so severely affected that he/she could not do anything alone, stay isolated and depressed, and lose independence.[8,20]

Another interesting finding of our study was that there was a statistically significant difference regarding the coexistence of dyslipidemia and thyroidopathy between RVO patients and controls. The association between dyslipidemia and RVO has been previously reported in other studies. Based on the pathophysiology of the disease, the atherosclerotic retinal artery, which shares a common adventitial sheath with the retinal vein, may cause RVO due to hypertension or dyslipidemia, in arteriovenous crossings in case of BRVO or at the level of the lamina cribrosa in CRVO patients.[5,25–29] However, the association between RVO and thyroidopathy has not been extensively examined. In a study involving 1009 patients with RVO, Hayreh et al. reported a correlation between RVO and thyroidopathy, suggesting that RVO may be secondary to hormonal alterations and dysregulation of metabolic pathways, leading to dyslipidemia and thrombus formation via the above-mentioned mechanism.[29,30] Further

Table 5. Univariate analysis of factors associated with health-related quality of life in patients with retinal vein occlusion.

	Composite VFQ-25 score	*P*-value	EQ-5D Index	*P*-value	EQ-5D VAS score	*P*-value
Age*	73.8 ± 3.0	.219	0.88 ± 0.14	.989	80.3 ± 8.2	.883
<73 (n = 32)	74.3 ± 4.3		0.88 ± 0.16		79.7 ± 10.2	
≥73 (n = 35)						
Gender	79.8 ± 9.8	.568	0.89 ± 0.15	.249	74.2 ± 4.1	.727
Male (n = 42)	80.4 ± 8.4		0.85 ± 0.14		73.8 ± 3.1	
Female (n = 25)						
Marital status	74.4 ± 4.1	.584	0.85 ± 0.17	.391	80.5 ± 11.3	.348
Married (n = 47)	73.9 ± 3.7		0.89 ± 0.14		79.8 ± 8.3	
Single/Divorced/Widowed (n = 20)						
Educational level	73.6 ± 4.1	.475	0.87 ± 0.15	.797	78.4 ± 9.8	.140
University (n = 38)	74.6 ± 3.3		0.89 ± 0.15		82.1 ± 8.2	
Secondary school (n = 29)						
Smoking	74.1 ± 3.2	.847	0.89 ± 0.16	.255	79.0 ± 9.7	.385
Yes (n = 41)	74.0 ± 4.6		0.86 ± 0.15		81.5 ± 8.5	
No (n = 26)						
Alcohol consumption	72.8 ± 3.0	**.019**	0.89 ± 0.15	.744	82.2 ± 8.2	.077
Yes (n = 29)	75.0 ± 4.0		0.87 ± 0.15		78.2 ± 9.7	
No (n = 38)						
Exercise	73.1 ± 2.	.608	0.89 ± 0.13	.445	82.1 ± 7.6	.093
Mild/Moderate (n = 21)	74.5 ± 4.17		0.87 ± 0.15		78.8 ± 9.5	
No (n = 46)						
Hypertension	73.9 ± 4.2	**.026**	0.89 ± 0.14	.513	80.3 ± 8.0	.934
Yes (n = 46)	74.4 ± 2.6		0.86 ± 0.15		79.3 ± 11.8	
No (n = 21)						
Diabetes Mellitus	72.3 ± 3.5	.172	0.95 ± 0.11	.091	79.0 ± 9.1	.453
Yes (n = 10)	74.4 ± 3.8		0.87 ± 0.15		80.2 ± 9.4	
No (n = 57)						
Dyslipidaemia	73.7 ± 3.6	.444	0.88 ± 0.15	.916	78.5 ± 7.3	.178
Yes (n = 26)	74.6 ± 4.0		0.88 ± 0.15		81.0 ± 10.3	
No (n = 41)						
Thyroidopathy	72.8 ± 2.5	**.024**	0.88 ± 0.16	.716	76.7 ± 10.3	.116
Yes (n = 21)	74.6 ± 4.1		0.86 ± 0.14		81.5 ± 8.4	
No (n = 46)						
Cardiovascular problems	73.9 ± 3.8	.722	0.87 ± 0.17	.769	77.3 ± 7.2	.095
Yes (n = 20)	74.3 ± 3.6		0.88 ± 0.14		81.2 ± 9.8	
No (n = 47)						
Coagulation disorders	74.5 ± 5.7	.343	0.74 ± 0.11	**<.001**	78.8 ± 7.1	.507
Yes (n = 12)	74.0 ± 3.3		0.91 ± 0.14		80.3 ± 9.7	
No (n = 55)						
Type of edema	72.7 ± 3.8	**.027**	0.87 ± 0.15	.418	79.5 ± 9.4	.597
Cystoid (n = 46)	74.7 ± 3.6		0.90 ± 0.14		81.2 ± 9.1	
Diffuse (n = 21)						
Ischemia	73.6 ± 4.0 75.6 ± 2.4	**.017**	0.87 ± 0.15	.735	83.3 ± 8.8	.118
Yes (n = 15)			0.88 ± 0.15		79.0 ± 9.2	
No (n = 52)						
Type of retinal vein occlusion	73.4 ± 4.1	.693	79.0 ± 10.1	.311	0.88 ± 0.15	.706
Central (n = 39)	74.5 ± 3.5		81.4 ± 7.8		0.87 ± 0.15	
Branch (n = 28)						
Ellipsoid zone	76.4 ± 3.7	**.004**	80.0 ± 8.6	.858	0.90 ± 0.13	.219
Intact (n = 43)	73.9 ± 3.8		80.0 ± 10.5		0.85 ± 0.17	
Disrupted (n = 24)						
External limiting membrane	76.6 ± 2.5	**.009**	80.3 ± 8.5	.896	0.89 ± 0.14	.062
Intact (n = 58)	73.7 ± 3.8		78.3 ± 13.9		0.79 ± 0.18	
Disrupted (n = 9)						
Central retinal thickness	75.4 ± 3.2	**.002**	80.1 ± 10.3	.895	0.91 ± 0.13	.086
<436 (n = 32)	72.6 ± 3.8		79.8 ± 8.1		0.85 ± 0.15	
≥436 (n = 35)						
Best corrected visual acuity (logMAR)	74.2 ± 3.7	**.021**	80.7 ± 10.1	.611	0.89 ± 0.14	.587
<0.3 (n = 29)	72.0 ± 3.8		79.5 ± 8.7		0.87 ± 0.16	
≥0.3 (n = 38)						

Table 6. Multivariate analysis of factors associated with VFQ-25 questionnaire in patients with retinal vein occlusion.

	Category/increment	Odds ratio (95%CI)	*p*-Value
Alcohol consumption	Yes vs. No	0.32 (0.11–0.92)	.034
Visual acuity, logMAR	0.1 increase	0.68 (0.49–0.93)	.017

studies are needed to confirm this observation and shed light on the potential involvement of thyroid hormone in the pathogenesis of RVO.

Additionally, patients with a higher education level, smokers, and those who did not exercise appeared to exhibit a greater risk for the development of RVO. Regarding education level, our findings could be explained by the fact that individuals with more education usually exhibit better compliance and seek health care more than others. Smoking and lack of exercise are known risk factors for the development of RVO, as it has been shown in previous studies, because sedentary life may cause potential venous stasis and secondary thrombus formation,[5,25] although cases of RVO have been reported after intense exercise,

which could be attributed to the transient reduction in retinal blood supply or to dehydration in general.[31,32]

Potential limitations of this study include its relatively small sample size and single-centered design. In addition, a longitudinal assessment could have been performed to examine the effect of treatment on the quality of life in patients with RVO. Nevertheless, to our knowledge, this is the first case-control study to evaluate not only the quality of life in RVO patients, but also the factors associated with it.

In conclusion, results of our study suggest that patients with RVO exhibited a lower level of vision- and health-related quality of life compared with controls. Health-related quality of life in RVO patients was found to be affected by alcohol consumption and visual acuity in a multivariate model. Potential risk factors should be identified and their early detection may improve the quality of life of such patients and lead to targeted health policies. Additionally, higher education level, smoking, lack of exercise, dyslipidemia and thyroidopathy were found independent risk factors for RVO presence. Therefore, as clinicians, ophthalmologists should be aware of the discrepancies that risk factors may confer and, thus, should focus on the most vulnerable subgroups, establishing priorities accordingly.

AVAILABILITY OF DATA AND MATERIAL

Data are available upon request.

CONFLICTS OF INTEREST/COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

CONSENT TO PARTICIPATE

Informed consent was obtained from all individual participants included in the study.

ETHICS APPROVAL

Approval was obtained from the ethics committee of Attikon University Hospital. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

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