

EFFECT OF DIFFERENT VISUAL IMPAIRMENT LEVELS ON THE QUALITY OF LIFE IN GLAUCOMA PATIENTS

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SUMMARY – The aim of this study was to assess the effect of different visual impairment levels on difference in the subjective quality of life estimation. We included 150 patients with glaucoma whose best-corrected visual acuity in the better-seeing eye was 0.5 and less. All of them were in advanced stage of the disease, with visual field defect worse than 12 dB in mean defect, when measured with the Octopus Visual Field Analyzer. In order to assess the quality of life, we used the Impact of Vision Impairment questionnaire. Additionally, we used General Information Questionnaire, which was developed for the purpose of this study. The information obtained from the questionnaires was analyzed using the Robust Discriminant Analysis program. Difference analysis was performed for each of the three areas of the questionnaire (reading and accessing information, mobility and independence, and emotional well-being). Results of this study confirmed the difference between the groups of patients with different levels of visual impairment, varying from total visual loss up to visual acuity 0.5 on the better-seeing eye in the effects of visual impairment on the quality of life. All levels of visual impairment had the largest effect in the area of reading and accessing information, slightly less in the area of mobility and independence, and the least effect was in the area of emotional well-being. Based on the results, it is concluded that all levels of visual impairment have negative effect on the quality of life in glaucoma patients.

Key words: Vision Disorders; Quality of Life; Glaucoma; Visual Acuity; Discriminant Analysis; Croatia

Introduction

Glaucoma is a chronic neurodegenerative disorder of the optic nerve, which causes retinal ganglion cell deterioration and loss of optic nerve axons, leading to structural and functional deficit¹. Optic nerve damage primarily results in peripheral visual field defect, and in advanced stage also to central visual field loss, loss of fixation², and decrease in visual acuity³.

Glaucoma is a progressive disease with symptoms that are difficult to recognize in early stages, thus resulting in impairment of visual functions and irrevers-

ible blindness^{4,5}. Visual impairment has a negative effect on physical activities, economic, social and psychological aspects of life⁶. As a result of visual impairment, patients with glaucoma have problems in orientation and mobility, activities of daily living, accessing information, and in communication. An increased incidence of depression and anxiety was also found in these patients⁷.

According to the research, people with visual impairment consider their visual impairment to have negative effect on their quality of life⁸⁻¹³. Quality of life, as defined by the World Health Organization (WHO), is the persons' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. Quality of life is a multidimensional concept that comprises different aspects of life. The individuals' quality of life has to be esti-

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mated through physical health, material, social and emotional well-being¹⁴.

Visual field damage, as well as impaired visual acuity affect negatively the performance in most of the activities of daily living and thus decrease the quality of life in glaucoma patients¹⁵⁻¹⁸. The main quality of life determinant in glaucoma patient is loss of visual functions. Loss of visual functions results in driving problems, trouble in seeing objects in peripheral vision, orientation and mobility problems, night vision problems, light and dark adaptation difficulties, reading and problems in estimating distance, which are the main reasons for the increased number of all-cause falls and serious injuries^{19,20}. Although it is commonly considered that these difficulties occur in later stages of the disease, it is apparent that they also occur at the beginning of the disease²¹⁻²³. Along with functional problems, in early stages of the disease, the quality of life is also disrupted by ongoing medication, frequent visits to the doctor, and stressful medical examinations (e.g., perimetry)²⁴⁻²⁶.

In this study, the aim was to assess the effect of different visual impairment levels on the difference in subjective quality of life estimation.

Patients and Methods

We included 150 glaucoma patients in this study. All of them were patients of the Glaucoma Unit, Department of Ophthalmology, Sestre milosrdnice University Hospital Centre. The best-corrected visual acuity (BCVA) on the better-seeing eye was less than 50% (≤ 0.5) in all study patients. Most of the patients had near normal vision, 68 of them had visual acuity (VA) of 0.5, 15 patients had visual acuity of 0.4, and 17 patients had visual acuity of 0.3. Moderately low vision was found in 14 patients, with visual acuity of 0.2. Severely low vision was found in 15 patients, with visual acuity of 0.1, while 21 patients had no visual perception. All of them were in an advanced stage of the disease, which is, according to the European Glaucoma Society (EGS), defined by visual field defect with mean defect (MD) worse than 12 dB, when measured with the Octopus Visual Field Analyzer. The mean age of study patients was 74 years; according to gender, there were 55% of female and 45% of male patients.

In order to collect information on the effect of visual impairment on the quality of life, we used the Im-

pact of Vision Impairment (IVI) questionnaire²⁷, which is a vision-specific quality of life instrument. This questionnaire consists of 28 variables. Answers are scored on a four-point scale: 0 ("a lot", meaning that visual impairment affects a lot the performance), 1 ("a fair amount"), 2 ("a little"), 3 ("not at all", meaning that visual impairment has no effect on the performance in activity), and 8 ("don't do this for other reasons", meaning that the person cannot perform the activity because of other reasons and not because of vision). The items scored 8 ("don't because of other reasons") were excluded from further analysis. This questionnaire measures the visual impairment effect on the quality of life in three areas: reading and accessing information, mobility and independence, and emotional well-being.

Upon obtaining approval from the appropriate regulatory authorities and ethics committees, verbal consent was obtained from all patients before entering the study.

Results

Information obtained from the questionnaires was initially processed using discrimination analysis in the robust discriminant analysis program (ROBDIS)^{28,29}. Differences in discrimination functions relating to visual acuity were tested using Single Factor Analysis of Variance (ANOVA). We confirmed difference among patients according to different visual acuity, varying from total visual loss up to visual acuity 0.5 on the better-seeing eye. Then we performed difference analysis for each of the three areas of the questionnaire (reading and accessing information, mobility and independence, and emotional well-being). Because of the small sample size in each group and because of non-normal distribution of the variables, we used Kruskal-Wallis H test. Results of the robust discriminant analysis in the area of reading and accessing information are presented in Figure 1.

Although we extracted five discriminant functions, only the first one proved significant at the level of $p < 0.05$. The position of arithmetic means in the first discriminant function showed that patients with visual acuity of 0.1 estimated their visual impairment to have negative effect on reading and accessing information, much more than patients with other visual acuity values. Moreover, the positive tendency of function in-

crease implied that better visual acuity had less effect on reading and accessing information. Results of the first discriminant function tended to oscillate in relation to visual acuity from having extremely negative effect in patients with visual acuity of 0.1 with a tendency to decline in the effect across the scale of visual acuity of up to 0.4. However, the effect was again very negative in patients with visual acuity of 0.5. Results of the robust discriminant analysis in the area of mobility and independence are presented in Figure 2.

We extracted five discriminant functions in this area too, and the first and second functions were significant at the level of $p < 0.05$. In the area of mobility and independence, graph direction had a negative slope that accompanied the increase in visual acuity. The position of arithmetic means in the first discriminant function showed extremely negative effect of visual impairment in patients with visual acuity of 0.1 and 0.5. There was a tendency of having less negative results associated with the increase of visual acuity in patients with visual acuity of less than 0.4.

While analyzing the second discriminant function, we noticed oscillations of the arithmetic means, which were positive in patients with visual acuity of 0.1 and 0.2, as well as in patients with amaurosis. Furthermore, they were negative in patients with visual acuity between 0.3 and 0.5. Results of the robust discriminant analysis in the area of emotional well-being are presented in Figure 3.

Statistically significant differences were found only in the second discriminant function, although five of them were extracted. Analysis of the discriminant function graph showed most of the results to be positively oriented, implying that visual acuity had no significant effect on emotional well-being estimation. We also noticed that the arithmetic means in this area were significantly different between the groups of patients only in the second discriminant function. The increase of visual acuity was associated with answers that were more positive and increase of arithmetic mean values, except for patients with visual acuity of 0.4 and amaurosis.

In order to determine differences between the variables describing the effects of visual impairment on the quality of life, we used Kruskal Wallis test. We analyzed each area of the IVI questionnaire in separate. Kruskal Wallis test results of the variables describing the area of reading and accessing information are presented in Table 1.

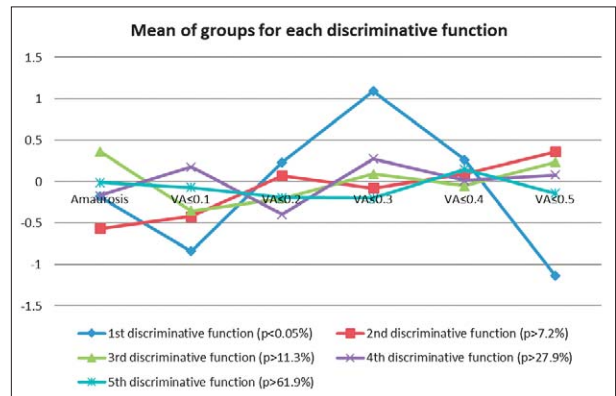


Fig. 1. Results of robust discriminant analysis in the area of reading and accessing information.

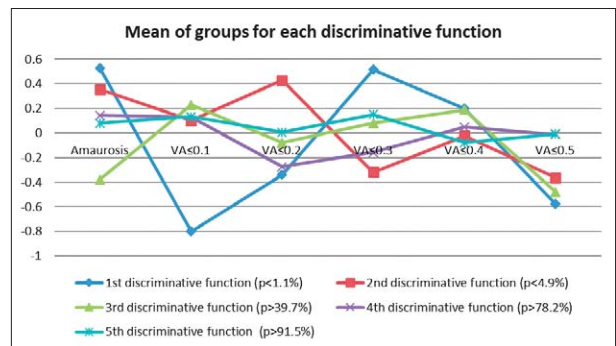


Fig. 2. Results of robust discriminant analysis in the area of mobility and independence.

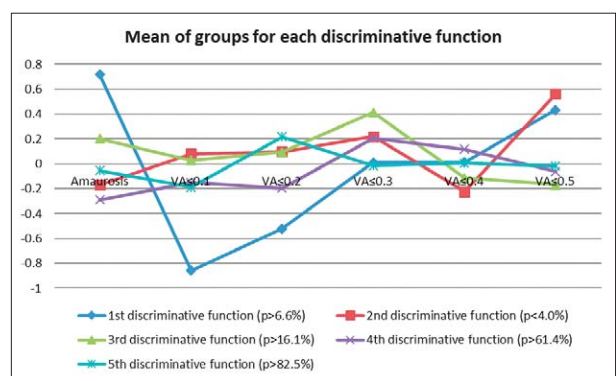


Fig. 3. Results of robust discriminant analysis in the area of emotional well-being.

Statistically significant differences in self-estimated quality of life were found in the IVI 8 (Reading labels or medication instructions) and IVI 14 (Reading black print in standard size – daily newspapers) variables. It is also important to mention that Kruskal

Table 1. Difference between the groups in the variables of reading and accessing information

Test statistics ^{a,b}									
	IVI1	IVI3	IVI5	IVI6	IVI7	IVI8	IVI9	IVI14	IVI15
Chi-square	10.987	8.383	5.084	9.500	5.422	13.814	9.243	16.259	10.658
Df	5	5	5	5	5	5	5	5	5
Asymp. Sig.	0.052	0.136	0.406	0.091	0.368	0.017	0.100	0.006	0.059

^aKruskal Wallis test; ^bgrouping variable: v.o.

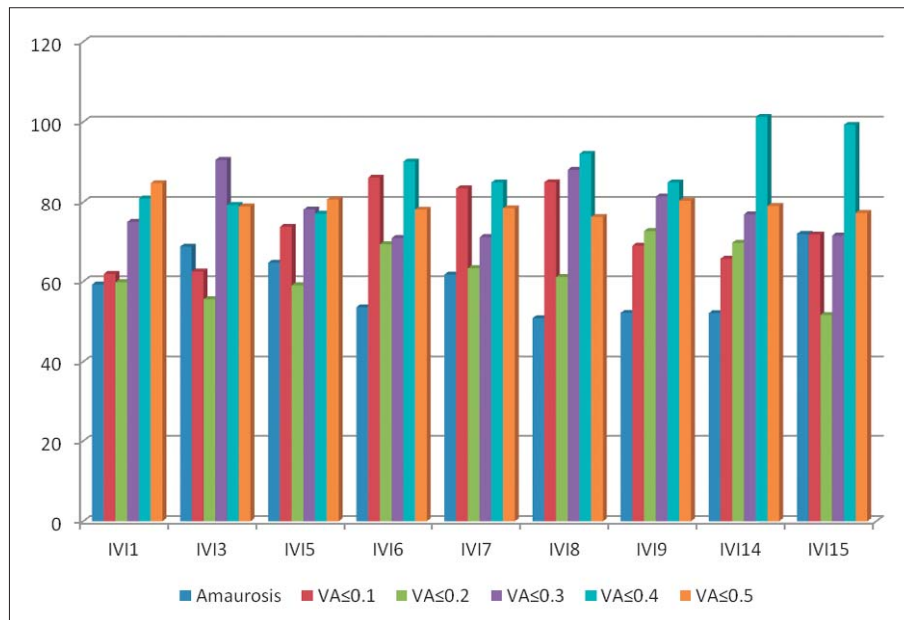


Fig. 4. Medium ranges of results for the area of reading and accessing information.

Table 2. Kruskal Wallis test results for the area of mobility and independence

Test statistics ^{a,b}						
	IVI2	IVI4	IVI10	IVI11	IVI12	IVI13
Chi-Square	4.613	3.627	3.742	6.169	7.416	0.613
df	5	5	5	5	5	5
Asymp. Sig.	0.465	0.604	0.587	0.290	0.191	0.987
	IVI16	IVI17	IVI18	IVI19	IVI20	
Chi-Square	1.726	3.341	1.296	11.002	5.331	
df	5	5	5	5	5	
Asymp. Sig.	0.886	0.648	0.935	0.051	0.377	

^aKruskal Wallis test; ^bgrouping variable: v.o.

Wallis test results in the IVI 1 (Your ability of watching and enjoying watching TV) and IVI 15 (Getting requested information) variables were close to the borderline of significance. The medium ranges of the results describing the area of reading and accessing information are presented in Figure 4.

Kruskal Wallis test results of the variables describing the area of mobility and independence are presented in Table 2.

According to Kruskal Wallis test results presented in Table 2, it was concluded that there was no significant difference in the area of mobility and independence in

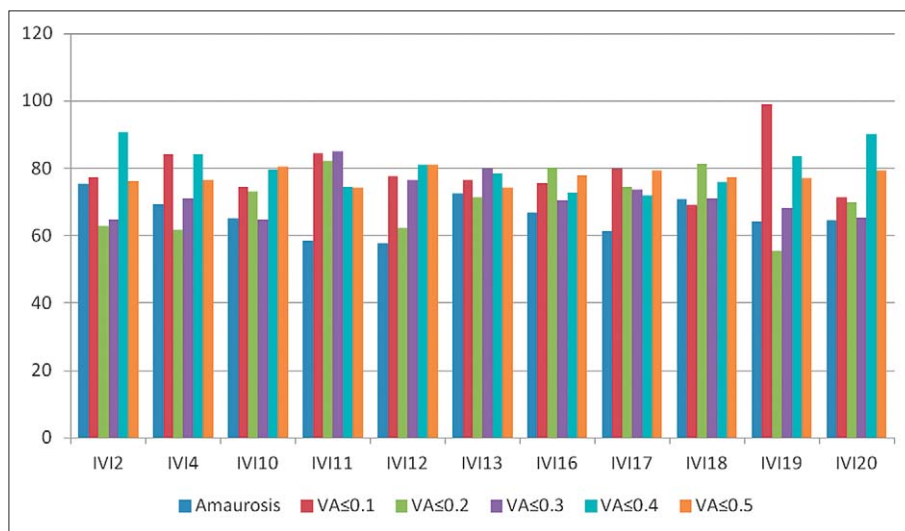


Fig. 5. Medium ranges of the results in the area of mobility and independence.

Table 3. Kruskal Wallis test results for the area of the well-being

Test statistics ^{a,b}								
	IVI21	IVI22	IVI23	IVI24	IVI25	IVI26	IVI27	IVI28
Chi-Square	3.646	6.477	2.014	5.240	11.108	3.411	3.716	6.357
Df	5	5	5	5	5	5	5	5
Asymp. Sig.	0.601	0.263	0.847	0.387	0.049	0.637	0.591	0.273

^aKruskal Wallis test; ^bgrouping variable: v.o.

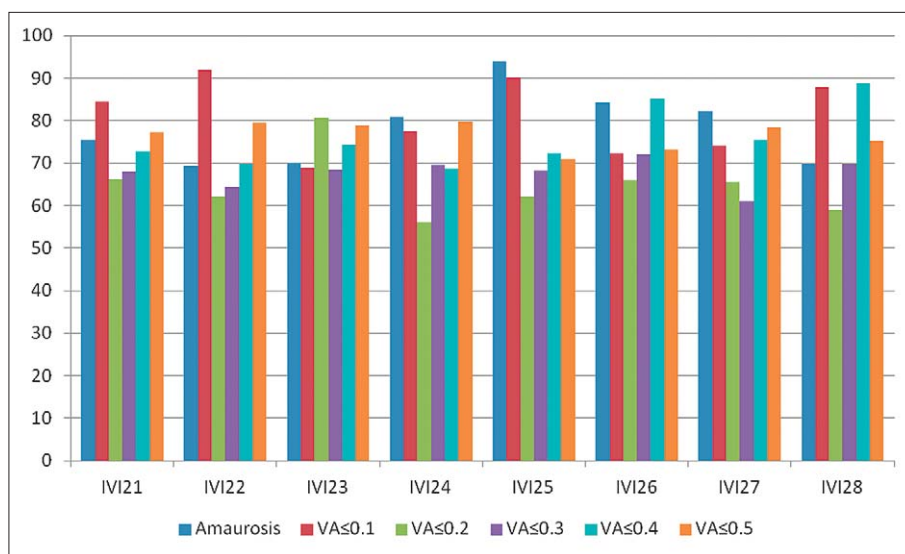


Fig. 6. Medium ranges of the results in the area of emotional well-being.

particular variables of the IVI questionnaire. The medium ranges of the results describing the area of mobility and independence are presented in Figure 5.

Kruskal Wallis test results of the variables describing the area of emotional well-being are presented in Table 3.

Statistically significant difference was found in the IVI 25 (How often were you concerned about your vision during last month) variable. In other variables describing emotional well-being, significant difference was not found. The medium ranges of the results de-

scribing the area of emotional well-being are presented in Figure 6.

Discussion

Results of our study confirmed that visual impairment had a negative effect on the quality of life in glaucoma patients. All levels of visual impairment had the largest effect on the quality of life in the area of reading and accessing information, slightly less in the area of mobility and independence, and the least effect was recorded in the area of emotional well-being. Problems the most patients have in the area of reading and accessing information are related to reading labels and medication instructions. The problem of reading black print standard size, daily newspapers and watching television was also very significant. Based on our results, we conclude that all patients from our study had problems in accessing information, even though these problems were unevenly distributed across the scale of visual acuity. We could assume that objective assessment of the effect of visual impairment on functional abilities in glaucoma patients would give results suggesting that the largest effect of visual impairment is in the area of accessing information, as well as in the activities with black print. Since patients from our study also noticed that visual impairment mostly interrupted these activities, we can assume that reduced availability of information causes significant problems in their lives¹. Such a finding is easier to comprehend if we consider the need of glaucoma patients for taking medications several times a day. Furthermore, because of advanced age, most of these patients have to take a number of other medications and at the same time they are unable to read the label and the instructions, which can cause serious problems^{30,31}.

In this study, we also confirmed that patients with a higher level of visual impairment had more negative effects on the activities of daily living and mobility^{3,5}. We obtained an interesting result related to this negative effect, which indicated that patients with visual acuity of 0.4 and 0.5 experienced more problems in this area than patients with lower visual acuity values. We can assume that this result was related to the level of daily activities in those patients. Patients with higher visual acuity values tend to stay more active, therefore they experience more problems than patients with lower visual acuity values, who become less active.

Emotional well-being in glaucoma patients is generally connected with visual impairment^{3,7,8,13,25}, although different degrees of vision loss are not related to self-estimation of emotional state.

This study confirmed that visual impairment had a negative effect on the quality of life in glaucoma patients¹⁻¹⁷. Nevertheless, disparities of results related to different levels of visual impairment indicate the need for further research. By expanding this research with inclusion of the objective functional assessment tests along with the subjective quality of life tests used, we would be able to provide better description of the effects that visual impairment has on the quality of life in glaucoma patients.

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Sažetak

UTJECAJ OŠTEĆENJA VIDA NA KVALITETU ŽIVOTA BOLESNIKA S GLAUKOMOM

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Cilj istraživanja bio je utvrditi utjecaj oštećenja vida na kvalitetu života bolesnika s glaukomom. Istraživanjem je obuhvaćeno 150 bolesnika s glaukomom, s ostatkom vida od 50% i manje na boljem oku (vidna oština $\leq 0,5$). Svi su bili u terminalnoj fazi bolesti, s oštećenjem vidnoga polja većim od 12 dB u *Mean Defects* (MD) mjerenim analizatorom vidnog polja Octopus. Za mjerenje utjecaja oštećenja vida na kvalitetu života primijenjen je upitnik *The Impact of Vision Impairment* (IVI), a dodatno je primijenjen upitnik vlastite izrade *General Information Questionnaire*. Prikupljeni podaci su obrađeni modelom robustne diskriminacijske analize (ROBDIS). Utvrđena je razlika između skupina ispitanika s različitim stupnjem oštećenja vida, od potpunog gubitka vida do ostatka vida na boljem oku od 50%. Za svako od tri područja (čitanje i pristup informacijama, kretanje i samostalnost te emocionalno blagostanje) učinjena je razlikovna analiza. Rezultati istraživanja potvrdili su da oštećenje vida utječe na kvalitetu života bolesnika s glaukomom. Najveći utjecaj različitih stupnjeva oštećenja vida bio je očit u području čitanja i pristupa informacijama, nešto manji u području orijentacije i kretanja, a najmanji u području emocionalnog blagostanja.

Ključne riječi: *vidne smetnje; kvaliteta života; glaukom; vidna oština; diskriminantna analiza; Hrvatska*