Book Chapter

Quality of Life of Patients with Glaucoma in Slovakia

Ľudmila Majerníková*, Anna Hudáková*, Andrea Obročníková, Beáta Grešš Halášsz and Mária Kaščáková

Department of Nursing, Faculty of Health Care, University of Prešov, Slovakia

*Corresponding Authors: Ludmila Majerníková, Department of Nursing, Faculty of Health Care, University of Prešov, Partizánska 1, 08001 Prešov, Slovakia

Anna Hudáková, Department of Nursing, Faculty of Health Care, University of Prešov, Partizánska 1, 08001 Prešov, Slovakia

Published April 21, 2021

This Book Chapter is a republication of an article published by Ludmila Majerníková, et al. at International Journal of Environmental Research and Public Health in January 2021. (Majerníková, Ľ.; Hudáková, A.; Obročníková, A.; Grešš Halášsz, B.; Kaščáková, M. Quality of Life of Patients with Glaucoma in Slovakia. Int. J. Environ. Res. Public Health 2021, 18, 485. https://doi.org/10.3390/ijerph18020485)

How to cite this book chapter: Ludmila Majerníková, Anna Hudáková, Andrea Obročníková, Beáta Grešš Halášsz, Mária Kaščáková. Quality of Life of Patients with Glaucoma in Slovakia. In: Prime Archives in Public Health. Hyderabad, India: Vide Leaf. 2021.

© The Author(s) 2021. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License(http://creativecommons.org/licenses/by/4.0/), which
permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Authors’ contributions:** Conceptualization: L.M. Data curation: B.G.H. Formal analysis: A.H. Funding acquisition: A.O., Investigation: L.M. Methodology: E.M. Project administration: M.K. Resources: A.H. Software: B.G.H. Supervision: A.O. Validation: A.H. Visualization: A.O. Writing-original draft: M.K. Writing-review-editing: B.G.H.

**Disclaimer:** This contribution was created within the framework of the grant project *KEGA: 002PU-4/2020:* Proposal of a methodology for evaluating the quality of life of patients with multiple sclerosis.

**Acknowledgments:** Authors would like to thank to respondents for participating in this research.

**Declaration of interest statement:** None of the following authors has any proprietary interests or conflicts of interest related to this submission. The authors themselves supported this work.

**Abstract**

**Purpose:** The aim was to identify and analyse the quality of life of patients with primary open-angle glaucoma (POAG) based on their visus and perimeter.

**Methods:** In the causal-comparative character, ex-post facto research, 119 patients with POAG represented the sample. Authors collected data using NEI VFQ-25 and WHOQOL-BREF tools.

**Results:** POAG patients over 18 years of age had no other ocular or chronic illnesses. The duration of glaucoma was 8.77 (SD±5.63) years. Binocular disability was observed in 68.0%. Using WHOQOL-BREF, there were significances found in the better-eye-vision group in psychological (p<0.001) and environment (p<0.001) domains. In the worse-eye-vision group,
we found significances in physical health \((p<0.001)\), environment \((p<0.001)\) and quality-related-to-health \((p<0.001)\) domains. Using NEI VFQ-25, there were significances found \((p=0.000)\) in all domains, except subscale driving.

**Conclusion:** Quality of life of patients with visual impairment is significantly lower in comparison to patients without a visual impairment.

**Keywords**

Primary Glaucoma with Open Iris-Corneal Angle; Visus; Perimeter; Quality of Life; WHOOQL-BREF; NEI VFQ-25

**Introduction**

In the health sciences, the assessment of quality of life is a current phenomenon, particularly in the field of nursing research. The quality of life of a patient with visual impairment can be assessed from several aspects. An important influencing factor is a vision protection method preserving vision from its loss caused by glaucoma. The main objective of the treatment is to maintain patients’ visual functions while considering the quality of his life. The major threat to patients with visual impairment is a gradual loss of vision. Diagnostics of chronic and potentially blinding disease itself constitutes anxiety and fear and requires some degree of acceptance and adaptation to changed visual perceptions. Changes in the mental state are related to the fear of progression of the disease, with possible permanent loss of vision. If visual impairment occurs, confrontation with functional loss due to visual impairment has a negative impact on the quality of life associated with vision as well as on general quality of life [1]. From a functional point of view, in the early-stages glaucoma affects the field of the peripheral vision later affects the central visual acuity. Other functional visual impairments may include defects of the colour perception, contrast sensitivity, and adaptation in darkness. The multifactorial accompanying aspects, as a result of altered visual functions, have an impact on the orientation in the field, the activities of everyday life in relation to the near and distant
vision, and colour vision. The information obtainment is also related to quality of life. It is a problem, specifically in information limitations caused by the disease, including the threat of sensory deprivation. Self-sufficiency, self-reliance, social and work enforcement, social status and prosperity are other aspects of the quality of life of a visually impaired patient. Early diagnostics and subsequent accurate treatment are the only methods of preventing vision damage. Despite advancements in glaucoma treatment, the global burden for society remains high and predictively it has an increasing tendency. Blindness and visual impairment are significantly associated with higher medical care costs, more days of informal care, and decreased health fitness. Frick, Gower et al. conducted a survey related to medical expenditures to obtain an estimate of relationships among the visual impairment and the blindness, and the total medical expenses, components of expenses, informal care days and health benefits. The component of home care and treatment costs were in the largest extent associated with loss of vision. The total annual economic impact included $ 5.5 billion spent on medical care and on the informal care in the US [2]. Primary open angle glaucoma (POAG) is the most common type of glaucoma representing three quarters (74%) of all glaucoma cases. The prevalence of POAG is highest in Africa and the prevalence of primary angle-closure glaucoma (PACG) is highest in Asia. In 2013, an estimated 64.3 million people aged 40–80 years were affected by glaucoma; in 2020 it can reach the number of 79.6 million people, and 111.8 million people in 2040 [3]. In 2009, there was 144,292 patients with glaucoma and 16,506 newly diagnosed patients registered in Slovakia. From 100,000 inhabitants, 3,352 people in 2009 were affected by glaucoma [4]. Because of the population development and demographic indicators, the incidence of glaucoma in Slovakia shows increases in this disease. In 2016, the number of individuals with glaucoma was almost the double, represented by 235,060 cases and newly reported 33,515 cases in comparison to 2009. It means that currently there are 4,325 registered patients with glaucoma per 100,000 inhabitants in Slovakia [5].
Materials and Methods

After permission for research by the Ethics Committee of The Autonomous Region of Prešov, the research was conducted from June to August 2018. The tenets of the declaration of Helsinki were adhered to in conduct of this research. We approached selected private ophthalmology outpatient clinics and asked the professional guarantors for consent to the research realization. Two standardized questionnaires were distributed within the research process: NEI VFQ-25 (National Eye Institute Visual Function Questionnaire-25) and WHOOQL-BREF (World Health Organization Quality of Life abbreviated version questionnaire). Patients were assigned according to predefined criteria (age, diagnose, informed consent to participate in this research). Each patient was informed of the purpose of data collection, anonymity, and how the results of the research project will be used. Each patient had signed the informed consent to participate in this research and to disclose additional data from his/her health-care documentation. In this study, 119 patients with POAG (100.0%) were selected. The response rate was 100.0%, as the completion of questionnaires was conducted as an individually managed interview with each patient in person. The directed interview with respondents lasted 20 to 40 minutes.

Characteristics of Used Methodology

To assess the quality of life, we used two standardized questionnaires. For better understanding and faster response to the questions by individuals as well as a possible visual impairment, questionnaires were completed with an assistance to each patient individually.

NEI VFQ-25 (Slovak Version)

The Slovak version of the NEI-VFQ 25 was translated from the original English version. The NEI VFQ-25 questionnaire is an abbreviated version of the original 51-item questionnaire. NEI VFQ-25 is a validated questionnaire and measurement tool for the quality of life assessment related to visual functions. It was developed and put into practice in English version by RAND in a
cooperation with NEI (National Eye Institute) in the United States of America. It has now been validated for use in multiple languages and has become a part of many studies. The translated questionnaire itself as well as the permission for its use for our research project was obtained from MUDr. Erika Vodrážková, MPH. Two independent accredited translators carried out the translation. After translators’ considerations, there were suggestions to outdoor activities in the Slovak version made for question A7 as walking, cycling, tourism, work in the garden, as opposed to activities: bowling, running, golf [6].

**WHOQOL-BREF (Slovak Version)**

A shortened version of WHOQOL-BREF questionnaire has been created for clinical practice and is currently available in 50 language versions, including the Czech language. It consists of four domains containing 24 questions and 2 separate questions focused on the assessment of quality of life and health satisfaction. The validated version of the questionnaire was used for the purposes of our work with the consent of the authors Dragomerická and Bartoňová from 2006 [7].

**Characteristics of Statistical Procedures**

For the analysis of sociodemographic indicators and other characteristics of the research sample, we used descriptive statistics (frequency, percentage, mean, and standard deviation). To detect the existence of a significant differences among independent groups, we used the Mann-Whitney U and Kruskal-Wallis tests. The aim was to find out whether the differences among medians of each group are statistically significant within the sample, suggesting the existence of the relationship among variables (p<0.05* significant, p<0.01** highly significant, p<0.001*** very highly significant, p<0.0001*** very very highly significant). Reliability was determined by Cronbach alpha coefficient and reached the value of 0.72 (sufficient internal consistency of the scale) [8].
Results

The study sample consisted of 119 patients with primary open-angle glaucoma (POAG). The study included patients diagnosed with and treated for POAG who do not suffer from other ocular illnesses, other chronic illnesses, were 18 years of age, and dispensarized in outpatient ophthalmologists who agreed to participate on the research. Research has a causal-comparative character, ex-post facto.

Socio-Demographic Data

Socio-demographic data provides a comprehensive picture of the research sample- general demographic data: gender, age and education of respondents; specific demographic data: visus and perimeter, length of treatment and POAG diagnosis depending on the impairment of the eye. A detailed analysis of demographic data is provided by the following descriptive evaluation (Table 1). Female respondents (65.0%) predominated in our sample. There was the highest number of secondary education graduates with maturity exam (28.0%), university education (21.0%) and primary education (18.0%). The mean age was 59.4 (SD±18.32) years, with the majority of the age group over 70 years. The duration of glaucoma was 8.77 (SD±5.63) years, with the dominance of respondents with a disease duration of less than 5 years (30.0%). Binocular affection was observed in 68.0% of respondents with glaucoma (Table 1).
Table 1: Socio-demographic data.

| Demographic data                              | n   | %   |
|-----------------------------------------------|-----|-----|
| **Sex**                                       |     |     |
| Man                                           | 42  | 35  |
| Woman                                         | 77  | 65  |
| **Education**                                 |     |     |
| Primary                                       | 21  | 18  |
| Vocational without maturity exam              | 16  | 13  |
| Vocational with maturity exam                 | 13  | 11  |
| Secondary vocational without maturity exam     | 10  | 8   |
| Secondary vocational with maturity exam        | 34  | 28  |
| University                                    | 25  | 21  |
| **Age (M ± SD)**                              |     |     |
| Less than 50 years                            | 27  | 23  |
| 51–59                                         | 22  | 18  |
| 60–69                                         | 33  | 28  |
| More than 70 years                            | 37  | 31  |
| **Duration of disease (M ± SD)**               |     |     |
| One year                                      | 20  | 30  |
| Less than 5 years                             | 36  | 28  |
| Less than 10 years                            | 33  | 25  |
| 11 years and more                             | 30  |     |
| **Diagnosed**                                 |     |     |
| Both eyes                                     | 79  | 68  |
| Right eye                                     | 26  | 22  |
| Left eye                                      | 11  | 9   |

The visual acuity (visus), as well as the range of the perimeter, are important diagnostic criteria for glaucoma. The status of the visual function of the respondents was assessed by objective measurements: examination of the visual acuity/visus (Snellen optotypes), assessment of peripheral vision status (computer perimeter). WHO classifies the severity of visual impairment. In relation of the visus examination results, we categorised our respondents with visual impairment as recommended by the WHO Classification of Vision Impairment (Table 2, 3).
Table 2: Frequency of respondents within visual impairment (visus) categories.

| Classification of Vision Impairment | EWV | EBV |
|-------------------------------------|-----|-----|
| 0  without visual impairment (normal) | 97  | 100 |
| 1  6/18 – 6/60 near-normal vision    | 14  | 9   |
| 2  6/60 – 3/60 moderate vision      | 2   | 4   |
| 3  3/60 – 1/60 severe vision impairment | 3  | 3   |
| 4  1/60, 1/50 moderate blindness     | 3   | 3   |
| 5  severe to total blindness        | 0   | 0   |
| Total                              | 119 | 119 |

Table 3: Frequency of respondents within visual impairment (perimeter) categories.

| Classification of Vision Impairment (perimeter) | EWV | EBV |
|-----------------------------------------------|-----|-----|
| 0  without visual impairment                  | 67  | 67  |
| 1  slightly advanced changes, mild loss of field of view (40-30° from the centre of fixation) | 24  | 25  |
| 2  advanced changes, moderate loss of field of view (20-10° from the centre of fixation) | 28  | 27  |
| 3  concentric narrowing of the field of view (15-5° from the centre of fixation) | 0   | 0   |
| 4  remnants of the field of view in absolute glaucoma (less than 5° from the centre of fixation) | 0   | 0   |
| Total                                         | 119 | 119 |

The comparison was based on the results of the visus, the eye with better vision (EBV) and the eye with worse vision (EWV). EWV was compensated in 97 cases and pathological findings were observed in 22 cases. EBV was well compensated in 100 cases, and pathological findings that could not be compensated in 19 cases (Table 2). Based on the perimeter results, we noticed a loss of field of view in EWV (n=67) and EBV (n=67). Pathological changes noticed in perimeter were found in EWV (n=52) and EBV (n=52) (Table 3). Respondents with glaucoma were divided into groups by the level of visual acuity: group with a physiological visus, and group with pathological findings.
that could not be sufficiently corrected. Using the WHOQOL-BREF questionnaire, we researched and compared responses of these two groups in terms of significantly different responses within the measured domains of quality of life. In the Table 4, we present significant differences using the Mann-Witney U test in perceived quality of life in: D1 domain Physical Health (EBV p<0.001; EWV p<0.01), D2 domain Psychological health (EBV p<0.001; EWV p<0.01), D4 domain of Environment (EBV p<0.001; EWV p<0.001), Q1 Quality of life (EBV p<0.001; EWV p<0.01), Q2 Health (EBV p<0.01; EWV p<0.001). These results were found in relation to pathological changes recognised on the eye with better vision and worse vision in terms of physiological/pathological visus. The results point to a higher level of that respondents´ perception of quality of life, who had well compensated eyesight. Only in D3 domain Social Relations differences were not confirmed. In terms of quality of life of patients with glaucoma and their perception assessment, domains D4 Environment (M=16.92), D3 Social relations (M=16.12) and D2 Psychological health (M=16.01) were evaluated the best from the aspect of EWV patients with physiologically compensated vision. Respondents with a pathological visus rated the best D3 Social relations (M=15.73), D4 Environment (M=16.92), and Psychological health (M=14.52). Both groups identified domain D1 Physical health as the worst field of quality of life, were the responses´ means of the patients with physiological visus was M=14.28 and with the pathological visus was M=12.0 (Table 5). According to the assessment of quality of life perception of patients with glaucoma, patients with physiologically compensated visus rated domains D4 Environment (M=16.98), D2 Psychological health (M=16.12) and D3 Social relations (M=15.94) the best. Respondents with pathological visus rated domains D3 Social relations (M=15.65), D4 Environment (M=14.49), and D2 Psychological health (M=14.33) the best. As the worst field of quality of life, both groups identified domain D1 Physical health with the responses´ means of the patients with physiological visus M=15.12 and with the pathological visus M=12.07.
WHOQOL-BREF Questionnaire Evaluation – Perimeter

The level of damage was classified based on the results of perimeter of EBV and EWV as follows 0-no loss of field of visus, 1-moderate changes, 2-advanced changes. In these groups, we compared the quality of life using WHOQOL-BREF, assuming a better quality of life for respondents with physiological findings or slightly advanced changes in their visus. Table 6 presents statistically significant differences in the quality of life perception. Respondents were divided into groups on the bases of perimeter. The analysis was conducted using a Kruskal-Wallis test. The results show significant differences in the perception of quality of life in all domains. Patients with lower pathogenicity expressed better rating of each field of quality of life than respondents with more severe vision impairment. In EBV patients, we noticed significant differences (Table 4) at $p<0.001$ in domains D1 Physical health, D4 Environment, Q1 Quality of life and Q2 Health, at level $p<0.01$ in domain D2 Psychological health, and at level $p<0.05$ in domain D3 Social relations. In EWV patients (Table 5) we noticed significant differences at $p<0.001$ in domains Q1 Quality of life and Q2 Health, at level $p<0.01$ in domains D1 Physical health, D2 Psychological health, D4 Environment, and at level $p<0.05$ in domain D3 Social relations.
Table 4: Differences in the domains of researched groups in terms of the physiological/pathological visus.

| Rating on EBV | Rating on EWV |
|---------------|---------------|
|               | Z   | p     | nVPa | nVPh | Z   | p     | nVPa | nVPh |
| D1            | -3.268 | 0.00108*** | 19  | 100  | -3.638 | 0.0002*** | 22  | 97  |
| D2            | -3.612 | 0.00030*** | 19  | 100  | -2.762 | 0.0057**  | 22  | 97  |
| D3            | -1.599 | 0.1096 | 19  | 100  | -1.516 | 0.1294 | 22  | 97  |
| D4            | -3.348 | 0.00081*** | 19  | 100  | -3.344 | 0.00082*** | 22  | 97  |
| Q1            | -3.09  | 0.0019**  | 19  | 100  | -2.738 | 0.0061**  | 22  | 97  |
| Q2            | -3.192 | 0.0014**  | 19  | 100  | -3.556 | 0.0003*** | 22  | 97  |

Notes: Z-coefficient; *p<0.05; **p<0.01; ***p<0.001; VPa visus pathologic; VPh – visus physiologic.

Table 5: Differences in domains’ means of researched groups in terms of the physiological/pathological visus.

| Rating on EBV | Pathological Visus | Physiological Visus |
|---------------|-------------------|---------------------|
|               | Pathological Visus | Physiological Visus |
|               | M   | SD    | Min - max | M   | SD    | Min - max |
| D1            | 12.07 | 1.86 | 8 – 16.35 | 15.12 | 1.94 | 9.45 – 16.94 |
| D2            | 14.33 | 1.72 | 9.65 – 19.33 | 16.12 | 2.02 | 9.01 – 20 |
| D3            | 15.65 | 1.97 | 8.5 – 20 | 15.94 | 2.55 | 9.67 – 20 |
| D4            | 14.49 | 2.35 | 9.48 – 18.79 | 16.98 | 2.62 | 8.82 – 20 |
| Q1            | 4.00  | 0.78 | 1 – 5 | 4.52  | 0.89 | 2 – 5 |
| Q2            | 2.59  | 0.89 | 4 – 2 | 4.0  | 0.88 | 1 – 5 |

| Rating on EWV | Pathological Visus | Physiological Visus |
|---------------|-------------------|---------------------|
|               | Pathological Visus | Physiological Visus |
|               | M   | SD    | min - max | M   | SD    | min - max |
| D1            | 12.0 | 1.82 | 8 – 16.35 | 14.28 | 1.95 | 9.98 – 17.82 |
| D2            | 14.52 | 1.78 | 9.28 – 19.24 | 16.01 | 1.99 | 9.01 – 20 |
| D3            | 15.73 | 2.01 | 8.1 – 20 | 16.12 | 2.52 | 10.1 – 20 |
| D4            | 14.59 | 2.25 | 9.48 – 18.79 | 16.92 | 2.72 | 8.79 – 20 |
| Q1            | 4.01  | 0.88 | 1 – 5 | 4.5  | 0.79 | 2 – 5 |
| Q2            | 2.59  | 0.96 | 4 – 2 | 4.0  | 0.96 | 1 – 5 |

Notes: M-mean; SD-standard deviation; Min-max- minimum and maximum value.
NEI VFQ-25 Questionnaire Evaluation– Perimeter

Table 6 and table 7 presents an analysis of statistically significant differences in perception of the quality of life represented among groups of respondents based on the perimeter using NEI VFQ-25. The results show significant differences in the perception of quality of life in domains. When comparing three groups, we noticed differences in the perception of the quality of life in all subscales (from the perspective of pathology/physiology) on the right as well as the left eye except for the subscale 10 Driving. Patients with lower pathogenicity expressed better rating in each subscale of quality of life compared to respondents with advanced visual changes. In all subscales, we discovered significant differences in the quality of life domains evaluated at level $p<0.001$. 
Table 6: Statistical evaluation of WHOQOL-BREF by Kruskal-Wallis test of EBV and EWV: perimeter.

|       | EBV perimeter |       | EWV perimeter |       |
|-------|---------------|-------|---------------|-------|
|       | Perimeter°    | Mean Rank | Kruskal-Wallis | Df | p     |
|       |               |          |               |     |       |
| D1    | 0             | 71.1     | 19.31         | 3   | 0.0001*** |
|       | 1             | 51.2     |               |     |       |
|       | 2             | 37.5     |               |     |       |
| D2    | 0             | 69.4     | 12.56         | 3   | 0.0019** |
|       | 1             | 49.1     |               |     |       |
|       | 2             | 44.8     |               |     |       |
| D3    | 0             | 67.2     | 9.91          | 3   | 0.049* |
|       | 1             | 51.2     |               |     |       |
|       | 2             | 47.0     |               |     |       |
| D4    | 0             | 70.4     | 15.19         | 3   | 0.0005*** |
|       | 1             | 46.5     |               |     |       |
|       | 2             | 44.5     |               |     |       |
| Q1    | 0             | 69.5     | 15.40         | 3   | 0.0005*** |
|       | 1             | 49.3     |               |     |       |
|       | 2             | 44.4     |               |     |       |
| Q2    | 0             | 71.7     | 22.32         | 3   | 0.000*** |
|       | 1             | 43.0     |               |     |       |
|       | 2             | 44.9     |               |     |       |

Notes: *p<0.05; **p<0.01; ***p<0.001
Table 7: Statistical evaluation of the NEI VFQ-25 by Kruskal-Wallis test of EBV and EWV: perimeter.

| EBV perimeter | Rating in fields | Perimeter° | Mean Rank | Kruskal-Wallis | Df | p    |
|---------------|-----------------|------------|-----------|----------------|----|------|
| Subscale 1    | 0               | 68.56      | 12.10     | 3              | 0.0024*** |
|               | 1               | 52.19      |           |                |    |      |
|               | 2               | 43.83      |           |                |    |      |
| Subscale 2    | 0               | 67.75      | 26.00     | 3              | 0.000*** |
|               | 1               | 66.46      |           |                |    |      |
|               | 2               | 30.70      |           |                |    |      |
| Subscale 3    | 0               | 68.53      | 20.67     | 3              | 0.000*** |
|               | 1               | 60.07      |           |                |    |      |
|               | 2               | 35.37      |           |                |    |      |
| Subscale 4    | 0               | 70.30      | 37.41     | 3              | 0.000*** |
|               | 1               | 62.13      |           |                |    |      |
|               | 2               | 28.06      |           |                |    |      |
| Subscale 5    | 0               | 73.89      | 43.61     | 3              | 0.000*** |
|               | 1               | 54.59      |           |                |    |      |
|               | 2               | 25.91      |           |                |    |      |
| Subscale 6    | 0               | 70.2       | 43.22     | 3              | 0.000*** |
|               | 1               | 62.0       |           |                |    |      |
|               | 2               | 36.4       |           |                |    |      |
| Subscale 7    | 0               | 74.55      | 40.92     | 3              | 0.000*** |
|               | 1               | 54.21      |           |                |    |      |
|               | 2               | 24.43      |           |                |    |      |
| Subscale 8    | 0               | 72.18      | 50.00     | 3              | 0.000*** |
|               | 1               | 59.76      |           |                |    |      |
|               | 2               | 25.22      |           |                |    |      |
| Subscale 9    | 0               | 69.21      | 63.50     | 3              | 0.000*** |
|               | 1               | 67.42      |           |                |    |      |
|               | 2               | 25.47      |           |                |    |      |
| Subscale 10   | 0               | 26.69      | 2.46      | 3              | 0.292 |
|               | 1               | 20.66      |           |                |    |      |
|               | 2               | 37.5       |           |                |    |      |
| Subscale 11   | 0               | 68.68      | 51.03     | 3              | 0.000*** |
|               | 1               | 63.04      |           |                |    |      |
|               | 2               | 31.72      |           |                |    |      |
| Subscale 12   | 0               | 72.02      | 52.78     | 3              | 0.000*** |
|               | 1               | 60.15      |           |                |    |      |
|               | 2               | 25.29      |           |                |    |      |
| Subscale | Rating in fields | Perimeter | Mean Rank | Kruskal-Wallis | Df | p     |
|----------|-----------------|-----------|-----------|---------------|----|-------|
| 1        | 0               | 69.8      | 16.69     | 3             | 0.000*** |
|          | 1               | 57.7      |           |               |    |       |
|          | 2               | 40.5      |           |               |    |       |
| 2        | 0               | 70.7      | 30.47     | 3             | 0.000*** |
|          | 1               | 70.2      |           |               |    |       |
|          | 2               | 32.5      |           |               |    |       |
| 3        | 0               | 70.5      | 24.01     | 3             | 0.000*** |
|          | 1               | 59.9      |           |               |    |       |
|          | 2               | 37.2      |           |               |    |       |
| 4        | 0               | 71.2      | 24.01     | 3             | 0.000*** |
|          | 1               | 64.6      |           |               |    |       |
|          | 2               | 37.2      |           |               |    |       |
| 5        | 0               | 77.8      | 56.96     | 3             | 0.000*** |
|          | 1               | 53.3      |           |               |    |       |
|          | 2               | 26.7      |           |               |    |       |
| 6        | 0               | 70.2      | 43.22     | 3             | 0.000*** |
|          | 1               | 62.0      |           |               |    |       |
|          | 2               | 36.4      |           |               |    |       |
| 7        | 0               | 75.7      | 46.07     | 3             | 0.000*** |
|          | 1               | 60.5      |           |               |    |       |
|          | 2               | 25.6      |           |               |    |       |
| 8        | 0               | 73.4      | 48.60     | 3             | 0.000*** |
|          | 1               | 60.7      |           |               |    |       |
|          | 2               | 30.1      |           |               |    |       |
| 9        | 0               | 70.67     | 50.47     | 3             | 0.000*** |
|          | 1               | 64.33     |           |               |    |       |
|          | 2               | 33.40     |           |               |    |       |
| 10       | 0               | 27.7      | 2.71      | 3             | 0.235    |
|          | 1               | 18.08     |           |               |    |       |
|          | 2               | 25.33     |           |               |    |       |
| 11       | 0               | 68.62     | 37.04     | 3             | 0.000*** |
|          | 1               | 62.5      |           |               |    |       |
|          | 2               | 38.25     |           |               |    |       |
| 12       | 0               | 74.91     | 58.57     | 3             | 0.000*** |
|          | 1               | 58.20     |           |               |    |       |
|          | 2               | 59.11     |           |               |    |       |

Notes: *p<0.05; **p<0.01; ***p<0.001
Discussion

The importance of this work lies in the fact that the quality of life of patients with glaucoma has not been investigated so far in the Slovak population. This issue was dealt with by authors in the Czech Republic [9], but it was only a pilot study involving only 20 patients with glaucoma. However, there are many studies in literature from other countries who actively deal with this issue [10-19]. Patients with binocular loss of visual functions have serious difficulties with daily activities such as reading, motion and orientation in the field, driving [20-22]. However, the quality of life (QoL) can also be affected by monocular loss of visual functions. In our study, we found statistically significant differences in the respondents’ perception of the quality of life in individual domains. Significant differences comparing visus of EBV and EWV were discovered in all domains except of domain D3 Social Relations. The greatest significance was in domain D4 Environment in relation to EBV, and in domain D1 Physical health in relation to EWV. Many foreign authors have assessed the quality of life of patients with POAG. Grow et al. in their study examined respondents with deteriorated socio-economic status [23]. The study involved 190 patients with different eye diseases in the age group of 60-107 years. Of the total number of respondents, 38.0% were POAG patients, and 41 of them had visual impairment problems, specifically of peripheral vision. The results of the study showed no significant statistical differences between the two groups depending on age, gender, marital status, income and perceived economic need. We identified significantly different quality of life indicators in patients with POAG. In our sample, statistical significance was found in almost all domains. The above-mentioned authors recorded this statistical significance in domains of Physical and Psychological health only. For comparison, a study by Kumari et al. reviewed patients divided into groups by types of disease. The study included 50 POAG patients and 50 patients with cataract disease as a control group. Patients with POAG reported statistically significant differences in all domains, including overall health status and quality of life differences in comparison to the group of patients with cataract (p<0.05) [24]. Because of its asymptomatic chronic nature and
the potential loss of vision, glaucoma is a psychological burden [25,26]. Restrictions on living caused by various factors, such as driving restrictions [22,27], fear of fall [28,29] and worsening of balance [30] contribute to the relationship between glaucoma and depression, too. Authors Berdeaux et al. included an identical number of 60 patients with POAG, age-related macular degeneration (AMD), and a control group of patients assessed for eye correction. The aim of the study was to identify signs of depression, anxiety and quality of life in POAG patients compared to patients with age-related macular degeneration (AMD). The symptoms of depression and anxiety were evaluated using the Hamilton Depression Rating Scale (HDRS) and the Hamilton Anxiety Rating Scale (HARS). The analysis of the results revealed that scores of patients with POAG and AMD in the domains of physical health, social relationships, the environment and psychological health were significantly lower than in the control group (p<0.05). Significant differences in the POAG group and in the AMD group (p<0.05) were not confirmed in any domains. A notifiable reduction in the quality of life of POAG and AMD patients was found. They were more depressed and anxious. From the authors' point of view, it is necessary to analyse the current psychological state of patients as an important predictor of QoL in terms of prognosis. A specialist must continuously dispensarize patients with psychical symptoms and ophthalmic diseases (glaucoma, AMD) [31]. The highest level of quality of life within the whole sample of respondents was noticed using the NEI VFQ-25, specifically in the subscales 11 Colour vision, 6 Social Functioning and 10 Driving. Toprak et al. also examined the overall assessment of visual functions in their research study. The authors found the highest scores in subscales: 11 Colour vision (100) and 5 Distance vision (94.4). On the contrary, the lowest score was observed in subscale 3 Ocular pain (57.0) [16]. For comparison, we analysed the results of a pilot study from the Czech Republic by Skorkovská et al. The examined sample consisted of 20 patients with POAG. The mean age of the subjects in the sample was 70.05 years (45-87). The lowest scores were obtained in the subscales 1 Health in general (48.3), 9 Dependency (58.3), 2 Vision in general and 7 Mental health both of the same value (61.4). On the contrary, subscales that remained almost
unchanged were 11 Colour vision (100), 6 Social functioning (95.3) and 10 Driving (94.4) [9]. In a further study of Floriani et al., authors evaluated the results obtained on a sample of 3169 patients with POAG using the NEI VFQ-25 questionnaire. The mean age of the patients was 66.9 years. In their study, the authors highlighted the high quality of life scores at the onset of the disease, while the progressive severity of the disease was causing a decline in quality of life. The worst score was observed in subscale Vision in general (69.2). Patients reported markedly higher scores in all domains with the disease in stage 0 (newly-diagnosed glaucoma- without damage to the optic nerve structures) versus stage 5 (severe damage to the optic and peripheral vision structures). The authors point out the need of early diagnostics and appropriate and effective treatment [12]. From the above results, it is clear, that patients with glaucoma generally perceive health as a negative state that causes psychic reactions (anger, anxiety, and hostility). The pathological eyes condition corresponds with the definition of WHO from the perspective of optimal health status as "the state of complete physical, mental and social well-being and not only the absence of disease or disability" [9]. In the results recorded by NEI VFQ-25 questionnaire, we confirmed statistically significant differences in the perception of quality of life based on the sample division from the point of view of perimeter pathology to EBV and EWV. In comparison of three groups, we noticed differences in the perception of quality of life in all subscales, except subscale Driving. Patients with lower pathogenicity expressed better results in each subscales of quality of life than respondents with more severe vision impairment. Similarly, Wolfram et al. conducted a similar research. The authors divided the sample of patients with POAG into three groups based on perimeter changes: low, moderate and advanced impairment. Data indicated low score for domain 1 Health in general (low 60.1, moderate 52.3, and advanced 44.4). Similarly, low values were noticed in the assessment of domain 2 Vision in general (low 83.8, moderate 76.9, and advanced 65.3) and domain 3 Ocular pain (low 87.2, moderate 81.3, and advanced 75.8). The highest rating in other subscales was represented by patients with POAG at low (100-87.2) and moderate impairment (91-88). The advanced POAG patients (60-63) presented lowest values [32].
The results show that the progression of the disease has an adverse effect on the quality of life. Their results correspond not only to our results but also to the results of other authors [9,12,16]. Finger et al. conducted a cross-sectional study on a sample of 1,085 patients with various ocular diseases including glaucoma, of which 254 were without ocular pathology (n=543 in Australia and n=796 in Germany). Differences in QoL assessed by VisQoL instrument were statistically significant in relation to an eye with better vision compared to an eye with worse vision with varying degrees of vision impairment. The generic EQ-5D instrument did not confirm the changes among the two group within the visual field. QoL indicators were confirmed in patients with diabetes (p<0.05), while the QoL score was significant in terms of variables: sex, age (p<0.001), and visual acuity (p<0.001). Results based on visual acuity using a generic tool are likely to underestimate the effect of visual impairment, especially if a better eye has no or minimal loss of visual acuity and the worse eye is mildly to severely visually impaired [33]. Sawada et al. focused on two groups of patients: with normotensive glaucoma (n=84), and POAG (n= 84). The average age of patients was 61.5 years. The quality of life was evaluated based on the results of the visus and the perimeter, dividing the patients into EBV patients and patients with EWV. Data collection was performed based on corrected visual acuity, which was measured as a logarithm of the minimum resolution angle (log10MAR) in both eyes in all patients. The authors' statement confirms the highly significant relationship between the quality of life and the results of the visus and the perimeter. With EBV based on the visus, the authors found statistically significant differences in four subscales: 2 Vision in general, 5 Distance vision, 4 Near vision, and 10 Driving (p<0.001). In the case of EWV, the authors found a very high significance (p<0.001) in 5 Distance vision and 4 Near vision, and statistically high significance also in the evaluation of 2 Vision in general (p<0.01). The authors in the assessment of perimeter reported similar results [18]. Gillespie et al. in their American study evaluated 401 patients with POAG in terms of quality of life by NEI VFQ-25. The average age of respondents was 58.0 years. The results showed that, based on EBV assessment, statistical significance was not confirmed in subscale 11 Colour.
Vision, but the statistical significance was confirmed in all other subscales. The highest scores in the results were reported by the authors in the overall health assessment, in the assessment of the difficulties in the individual roles, in driving, in mental health, in peripheral vision, in near vision, in distant vision, and in social functions. These results were statistically very high (p<0.001) [13].

Conclusion

From the analysis of the results of this study, we confirm that patients with impaired vision have subjectively evaluated their quality of life more negatively than those with better vision. The results were very significant in all dimensions of quality of life using WHOQOL-BREF and NEI VFQ-25 instruments. We declare the need to promote active screening of glaucoma in the Slovak Republic and to examine the issue of quality of life of patients with eye diseases, including glaucoma in the Slovak population. Christen et al. examined the impact of multivitamin use on cataract incidence and age-related macular degeneration (AMD). Over the 11.2 years of research of health status of men aged less than 50 years of age receiving multivitamins, and men taking placebo, there was a significant difference in the reduction of cataract and AMD risk found, particularly between the group of respondents taking multivitamin including 872 patients with cataracts, and 945 placebo-treated cataract patients (p=0.04), and in the case of AMD, 152 patients receiving multivitamins and 129 cases receiving placebo (p=0.15) [34]. This study provided interesting results. Hypothetically, it would be appropriate to carry out a similar study in patients with glaucoma focusing on prevention.

References

1. Skalicky S, Goldberg I. Quality of Life in Glaucoma Patients. US Ophthalmic Review. 2013; 6: 6-9.
2. Frick KD, Gower EW, Kempen JH, Wolff JL. Economic impact of visual impairment and blindness in the United States. Arch Ophthalmology. 2007; 125: 544-550.
3. Yih-Chung Tham, Xiang Li, Tien Y Wong, Harry A Quigley, Tin Aung, et al. Global Prevalence of Glaucoma and Projections of Glaucoma Burden through 2040. A Systematic Review and Meta-Analysis. Ophthalmology. 2014; 121: 2081 -2090.

4. Zdravotnícka ročenka Slovenskej republiky 2009. Bratislava: Národné centrum zdravotníckych informácii. 2010.

5. Zdravotnictvo Slovenskej republiky v čísľach 2016. Bratislava. Národné centrum zdravotníckych informácií. 2018.

6. Vodrážková E. Šefčíková S, Helbich M. Psychometrická validácia verzie „Dotazníka zrakových funkcí – 25“ v podmienkách Slovenska. Česká a Slovenská oftalmologie. 2012; 68: 102-107.

7. Dragomerická E. Bartoňová, J. WHOQOL-BREF. WHOQOL-100. Praha: Psychiatrické centrum. 2006.

8. Rimarčík, M Základy štatistiky. Bratislava: FZSP Vysoká škola sv. Alžbety. 2010.

9. Skorkovská K. Cesneková T, Skorkovská, Š. Informovanost a kvalita života pacientů s glaukomem. Česká a Slovenská oftalmologie. 2009; 65: 97 -101.

10. Kong XM. Zhu WQ, Hong JX, Sun XH. Is glaucoma comprehension associated with psychological disturbance and vision-related quality of life for patients with glaucoma? A cross-sectional study. Journal BMJ Open. 2014; 4: 1-9.

11. Lorenzana L, Lankanarian D, Dugar J. A New Method of Assessing Ability to Perform Activities of Daily Living: Design, Methods and Baseline Data. Ophthalmic Epidemiology. 2009; 16: 107-114.

12. Floriani I, Quaranta L, Rulli E. Health-related quality of life in patients with primary open-angle glaucoma. An Italian multicentre observational study. Acta Ophthalmologica. 2015; 94: 1-9.

13. Gillespie BW, Musch DC, Niziol LM, Janz NK. Estimating Minimally Important Differences for Two Vision-Specific Quality of Life Measures. Investigative Ophthalmology & Visual Science. 2014; 55: 4206-4212.
14. Labiris G, Katsanos A, Fanariotis M. Psychometric properties of the Greek version of the NEI-VFQ 25. BMC Ophthalmology. 2008; 8: 1-11.

15. Alavi Y, Jofre-Bonet M, Bunceet C. Developing an Algorithm to Convert Routine Measures of Vision into Utility Values for Glaucoma. Ophthalmic Epidemiology. 2011; 18: 233 - 243.

16. Toprak BA, Eser E, Guler C, Baser FE, Mayali H. Cross-validation of the Turkish Version of the 25-Item National Eye Institute Visual Functioning Questionnaire (NEI-VFQ 25). Ophthalmic Epidemiology. 2005; 12: 259-269.

17. Richman J, Lorenzana L, Lankaranian D. Relationships in glaucoma patients between standard vision tests, quality of life, and ability to perform daily activities. Ophthalmic Epidemiol. 2010; 17: 144–151.

18. Sawada H, Fukuchi T, Abe H. Evaluation of the relationship between quality of vision and the visual function index in Japanese glaucoma patients. Graefe's Archive for Clinical and Experimental Ophthalmology. 2011; 249: 1721-1727.

19. Altangerel U, Spaeth GL, Steinmann WC. Assessment of Function Related to Vision (AFREV). Ophthalmic Epidemiology. 2007; 14: 51-52.

20. Friedman DS, Freeman E, Munoz B, Jampel HD, West SK. Glaucoma and mobility performance: the Salisbury eye evaluation project. Ophthalmology. 2007; 114: 2232-2237.

21. Haymes SA, Leblanc RP, Nicolela MT, Chiasson LA, Chauhan BC. Glaucoma and on-road driving performance. Invest Ophthalmol Vis Sci. 2008; 49: 3035–3041.

22. Ramulu P. Glaucoma and disability: which tasks are affected, and at what stage of disease? Curr Opin Ophthalmol. 2009; 20: 92-98.

23. Grow SL, Sudnongbua S, Boddy J. The Impact of Visual Disability on the Quality of Life of Older Persons in Rural Northeast Thailand. Journal of Visual Impairment & Blindness. 2011; 105: 361-369.

24. Kumari N, Pandav SS, Ram J, Kaush S. Visual disability, quality of life and burden of care in glaucoma patients. General aspects: epidemiology. 2011; 32.
25. Jampel HD, FricK KD, Janz NK. Depression and mood indicators in newly diagnosed glaucoma patients. Am J Ophthalmol. 2007; 144: 238-244.
26. Janz NK, Wren PA, Guire KE, Gillespie BW, Lichter PR. Fear of blindness in the collaborative initial glaucoma treatment study: patterns and correlates over time. Ophthalmology. 2007;114: 2213-2220.
27. Campbell MK, Bush TL, Hale WE. Medical conditions associated with driving cessation in community-dwelling, ambulatory elders. J Gerontol. 1993; 48: 230-234.
28. Freeman EE, Munoz B, Rubin G, West SK. Visual field loss increases the risk of falls in older adults: the Salisbury eye evaluation. Invest Ophthalmol Vis Sci. 2007;48: 4445-4450.
29. Murphy SL, Dubin JA, Gill TM. The development of fear of falling among community-living older women: predisposing factors and subsequent fall events. J Gerontol A Biol Sci Med Sci. 2003; 58: 943–947.
30. Popescu ML, Boisjoly H, Schmaltz H. Explaining the relationship between three eye diseases and depressive symptoms in older adults. Invest Ophthalmol Vis Sci. 2012; 53: 2308-2013.
31. Berdeaux GH, Nordmann JP, Colin E, Arnould B. Vision-related quality of life in patients suffering from age-related macular degeneration. Am J Ophthalmol. 2005; 139: 271–279.
32. Wolfram C, Lorenz K, Breitscheidel L, Verboven Y, Pfeiffer N. Health- and vision-related quality of life in patients with ocular hypertension or primary open-angle glaucoma. Ophthalmologica. 2013; 229: 227-234.
33. Finger RP, Fenwick E, Hirneiss CHW, Hsueh A, Guymer RH, et al. Visual Impairment as a Function of Visual Acuity in Both Eyes and Its Impact on Patient Reported Preferences. Plos/One. 2013; 12: e81042.
34. Christen WG, Glynn RJ, Manson JE, MacFadyen J, Bubes V, et al. Effects of Multivitamin Supplement on Cataract and Age-Related Macular Degeneration in a Randomized Trial of Male Physicians. Ophthalmology. 2014; 121: 525–534.