

The Role of Visual Acuity in Daily Functioning and Quality of Life in Diabetic Retinopathy Patients _____

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Abstract

Purpose: *To assess the relationship between visual acuity and activities of daily living in patients with diabetic retinopathy and how this relationship affects their quality of life.*

Methodology: Fifty-nine persons over the age of 18 who were residents of the city of Varna and had information about the presence of DR who passed through the Department of Endocrinology UMBAL “St. Marina”—Varna and the office for laser treatment of retinal diseases of University Specialized Eye Hospital—Varna from February to April 2024 were included. The National Eye Institute Visual Function Questionnaire-25 was translated and adapted into Bulgarian to assess the patient’s quality of life. The results were processed using statistical analysis software - SPSS v.21.

Findings: According to the degree of retinal involvement by diabetic retinopathy, the median visual acuity was as follows: NPDR, 0.7 (IQR=0.225); PDR, 0.6 (IQR=0.375); DME, 0.5 (IQR=0.425). Analysis revealed a statistically significant difference in visual acuity between the three groups $\chi^2= 6.78$; $p= 0.034^*$). There was also a moderate positive correlation (Spearman’s rho = 0.462) indicating a significant relationship between visual acuity and social functioning ($p<0.001^*$) and a moderate to strong positive correlation (Spearman’s rho = 0.636) demonstrating the existence of a significant relationship between visual acuity and mental health ($p<0.001^*$).

Originality/value: This study provides fresh insights into how visual acuity affects daily functional abilities in patients with diabetic retinopathy. The findings offer practical guidance for clinical and public health interventions aimed at enhancing patient autonomy and well-being.

Keywords: diabetic retinopathy, quality of life

Introduction

Diabetes mellitus (DM) has become one of the most critical public health challenges of the 21st century and is considered by many to be a global epidemic. It is one of the most prevalent endocrine diseases, affecting approximately 10.5% of the world’s population aged 20-79. (Home et al., n.d.) In Europe, the number of DM patients exceeded 61 million in 2022; the expectation is that it will increase by 13% to reach 69 million by 2045. (Home et al., n.d.) Lack of reasonable control of DM leads over time to significant impairment of several organs and systems, significantly affecting people’s quality of life.

Diabetic retinopathy (DR), one of the complications of diabetes, is considered to be the leading cause of vision loss and preventable blindness among the working-age population under 65 years of age in economically developed countries. (Zlatarova et al., 2024) The average incidence of DR among people with diabetes is 34.6%. (Hristova et al., 2021) (Zlatarova et al., 2024) After 20 years of disease, almost all patients with type I, and more than 60% of those with type II diabetes



mellitus, develop diabetic retinopathy to some degree. (Lee et al., 2015) (Home et al., n.d., p. 202) Retinopathy is known to cause loss of contrast sensitivity. (Shani et al., 2018) (Davis et al., 1998) Laser pan-retinal photocoagulation, in turn, is associated with visual field loss. These consequences of diabetic retinopathy inevitably affect patients' quality of life (QoL).

The World Health Organization (WHO) defines quality of life as “an individual's 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.” (Howes et al., 1982)

It is a well-known fact that the presence of DR leads to a reduction in quality of life. (Sokol et al., 1985) ranging from 0.5 to 22.8 cycles/degree (c/deg (*WHOQOL - Measuring Quality of Life*| *The World Health Organization*, n.d.) As previously mentioned, it can significantly impact visual acuity, potentially impeding basic daily activities such as reading, driving, and facial recognition. Assessing QoL provides insight into patients' practical challenges when performing routine daily tasks. Loss of vision as a result of DR can have profound psychological consequences, leading to anxiety, depression, and a reduced sense of independence. Assessing QoL helps to understand and address these psychological aspects, promoting holistic patient care. A major shortcoming of our healthcare system is the need for a holistic approach to the condition of patients. Understanding the impact of diabetic retinopathy on a patient's QoL can guide healthcare professionals in making informed decisions about treatment options. Balancing interventions' potential benefits and risks with their impact on daily living is critical to patient-centered care. Awareness of patients' challenges when incorporating treatment into their lives helps tailor interventions to meet individual needs better.

The study aims to explore the relationship between visual acuity and activities of daily living in patients with diabetic retinopathy, focusing on how these factors influence their overall quality of life.

Methodology

Patients diagnosed with DM enrolled in the “Electronic Registry of Diabetes and Diabetic Retinopathy” participated in the study. Patients are enrolled in the registry after a pre-signed informed consent; the requirement is that the patient is diagnosed with DM, over 18 years of age, and has a permanent address in Varna, Bulgaria. These patients have been admitted to the Endocrinology Clinic at the University Hospital “St. Marina” - Varna and, on a predetermined day each week, underwent visual acuity and fundus examination with a portable fundus camera and a questionnaire. The group also included patients examined by indirect ophthalmobiomicroscopy in the University Specialized Eye Hospital

- Varna laser treatment office. In both cases, the fundus photography was performed by a trained ophthalmology resident or specialist in ocular diseases, and the reading of the photographs and the staging of diabetic retinopathy - by an ophthalmologist experienced in the diagnosis and treatment of retinal pathology using the international clinical classification system of DR and diabetic macular edema. (Davidov et al., 2009)visual acuity, diabetic retinopathy (DR The study was conducted between February and April 2024.

The objective assessment of the visual acuity of the study participants was performed by clinical examination, including visual acuity without and with optimal optical correction, anterior segment examination (corneal status, lens status for the presence of cataracts, which would also affect their quality of life and relevant to the statistical processing of the data), vitreous status and posterior segment with retinal assessment and classification of the type and severity of DR. All of these clinical data allow the determination of the stage of the disease and, subsequently, the accurate assessment of the relationship between the type and severity of DR and the quality of life of these patients.

The NEI-VFQ-25 questionnaire was translated and adapted into Bulgarian to assess the patient's quality of life. (Alcubierre et al., 2014) It is a tool for assessing visual function and vision-related quality of life in patients with various eye diseases. It contains 25 questions divided into 12 subscales assessing visual function and quality of life.

The relationship between questionnaire results and clinical outcomes was evaluated using the statistical data processing software SPSS v.21.

Results

Seventy individuals were invited to participate in the study, and 59 were included in the study group, all diagnosed with diabetes mellitus. From the analysis, it was clear that there was no normal distribution in the age category. This was because a large proportion of the patients in the study group were diabetics with type 2 diabetes, which is characteristic of the more advanced age group.

The median age of the participants was 62 years (IQR=13). Type 2 DM accounted for 94.9% of study participants, and type 1 DM accounted for 5.1%. The group comprised 31 women (52.5%) and 28 men (47.5%).

Fig. 1 shows the distribution of patients based on the severity of DR retinal damage. We divided retinal damage into three groups: nonproliferative DR (NPDR), proliferative DR (PDR), and diabetic macular edema (DME).

FIGURE 1. Distribution of study subjects according to severity of DR



The visual status according to patient perception is presented in Fig. 2, with more than half of the respondents (50.4%) considering their vision “good.” This is most likely because DR can damage both eyes to varying degrees. This sets the stage for maintaining relatively good overall vision based on better vision in the one eye less affected by the disease. The subjective perception of good vision may also be due to effective treatment, early detection of diabetic retinopathy, reasonable diabetes control, regular eye examinations, and timely interventions.

A significant group of patients (37.3%) have “known visual problems” that may not be severe but still affect their daily lives. Patients in this group are likely to experience some difficulty with their vision, but not to the extent of classifying it as poor. They may have symptoms such as blurred vision, difficulty reading, or night vision problems that are not yet severe enough. The results highlight the need for a personalized approach to the treatment and follow-up of patients with diabetic retinopathy.

Patients who rate their vision as poor (8.5%) may need more intensive interventions and maintenance. Encouragingly, only 1.7% of respondents rated their vision as “very poor,” and there were no patients with complete blindness. This indicates that severe visual impairment is relatively rare among the participants and that effective management of diabetes and its complications is provided by promising access to eye care and timely treatment of diabetic retinopathy.

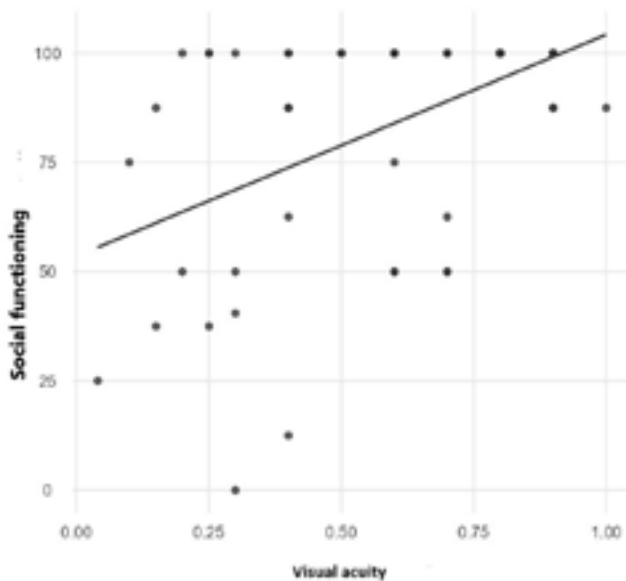
FIGURE 2 Vision status as perceived by the study group



To determine whether and to what extent, based on available clinical assessment, we could predict patient quality of life, we assessed patients' visual acuity, as we believe it best reflects visual system function. In patients where the visual acuity of the two eyes differed, we took the visual acuity of the better eye for the study. According to the degree of retinal involvement by diabetic retinopathy, the median visual acuity was as follows: NPDR, 0.7 (IQR=0.225); PDR, 0.6 (IQR=0.375); DME, 0.5 (IQR=0.425). The minimum visual acuity in the NPDR group was 0.25; in the PDR group, 0 (monocular absence of vision); in DME, 0.1. Analysis revealed a statistically significant difference in visual acuity between the three groups $\chi^2= 6.78$; $p= 0.034^*$).

We performed a nonparametric Spearman analysis to establish the relationship between visual acuity and quality of life in subscales reflecting social functioning and mental health. The moderate positive correlation (Spearman's rho = 0.462) that we obtained indicates that there is a significant relationship between visual acuity and social functioning ($p<0.001^*$) - Fig. 3

FIGURE 3 Linear correlation between visual acuity and social functioning



Higher visual acuity is associated with better outcomes in social functioning. These results only highlight the importance of maintaining and improving visual acuity in patients to improve their social functioning and quality of life. In terms of mental health, the analysis showed similar results, with a moderate to strong positive correlation (Spearman's rho = 0.636), demonstrating the existence of a significant relationship between visual acuity and mental health ($p<0.001^*$). Better visual acuity was associated with better scores on the mental health subscale.



Table 1 shows Spearman’s nonparametric correlation analysis, which includes subscales reflecting visual function and visual acuity.

TABLE 1. Relationship between indicators reflecting visual function and visual acuity

	Correlation coefficient (Spearman’s rho)	Degree of freedom (df)	Statistical significance (p-value)
Close range activities	0.653	57	p<0.001*
Long distance activities	0.659	57	p<0.001*
Difficulties in performing daily tasks	0.577	57	p<0.001*
Dependence on others due to vision problems	0.577	57	p<0.001*
Driving	0.569	57	p<0.001*
Color vision	0.504	57	p<0.001*
Peripheral vision	0.237	57	p<0.071

The table’s results are similar to those obtained in the nonparametric correlation analysis for social functioning and mental health, except for the subscale reflecting peripheral visual function.

Discussions

A large number of studies have demonstrated that visual impairment has a direct negative impact on health-related quality of life (HRQoL) in patients with DR. (*International Clinical Classification System for Diabetic Retinopathy and Diabetic Macular Edema - 2012*, 2012, p. 201) (*Visual Function Questionnaire 25 | National Eye Institute*, n.d.) (Boisjoly et al., 1999)ocular history, best-corrected visual acuity, and detailed ocular examination data were collected. Functional visual impairment information was obtained by telephone interviews using the following: VF-14, SF-36 (Short Form-36, a more generic measure of general health function Diabetic retinopathy can have a severe effect on a patient’s psychological well-being, which was confirmed by our results. In addition to the physical challenges associated with the disease, patients with diabetic retinopathy also face severe emotional stress, anxiety, and depression, which can impact their daily life and quality of life. (Klein et al., 2001) Diabetic retinopathy affects not only patients’ physical health but also psychological aspects. Loss of vision or reduction in visual function can cause severe emotional reactions in patients, including depression, anxiety, and reduced self-esteem. People face fear and anxiety about their future, loss of independence, and the ability to function independently. (Musch et al., 1997) (Saitakis et al., 2023)including the kidneys, heart, and the central nervous system, with ophthalmic involvement and Diabetic Retinopathy (DR Our results also confirmed that patients with diabetic retinopathy often face social challenges

and limitations. (Wulsin et al., 1987) Visual problems can lead to social isolation and limitations in relationships with family, friends, and society. They may have difficulty participating in social events, sporting and cultural activities, and professional gatherings, which can cause feelings of isolation and rejection.

Limitations

- A small sample size limits the statistical power of the analysis and makes it possible to detect significant effects. The small sample size may also make it difficult to generalize the results to a wider population.
- Regional Focus: The study's findings are specific to Varna, Bulgaria, and may not apply broadly to other populations or healthcare systems.
- The instruments used to measure the variables may not be sufficiently valid or reliable. For example, subjective assessments of quality of life and mental health may be influenced by participants' current state or their interpretation of the questions.

Conclusion

The results highlight the importance of early diagnosis and effective treatment of diabetic retinopathy to improve visual acuity, which can improve patients' social functioning and mental health. The specifics of the research conducted in Bulgaria provide valuable information on local problems and opportunities for improvement that can be used to develop effective health policies and patient support programs.

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