

# ASSESSMENT OF THE SUBJECTIVE VISUAL DYSFUNCTION OF PATIENTS WITH MULTIPLE SCLEROSIS USING SPECIALIZED QUESTIONNAIRES

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## ABSTRACT

Recently, the questions of the limited opportunities for measurement of the subjective and often subclinical visual dysfunction are very topical. NEI-VFQ, the questionnaire of the National Eye Institute in the USA and VFQ-25, its short version (25-item Vision Function Questionnaire) are validated for visual-specific assessment of the quality of life of multiple sclerosis (MS) patients. MSVQ-7, a specific 7-item MS Vision Questionnaire is proposed, too. The authors used the VFQ-25 translated into Bulgarian, the MSVQ-7 and their correlation with the binocular visual acuity. These questionnaires were administered to 108 MS patients without history of optic neuritis and after optic neuritis as well registered in the MS Centre in Varna and to 30 healthy subjects. There was a statistically significant difference ( $p < 0,0001$ ) between MS patients and controls in all sub-scales and in the overall results from VFQ-25. The analysis of MSVQ-7 showed a statistically significant difference between the answers of question Nos 1, 2, 3 and 5 ( $p < 0,001$  to  $p = 0,015$ ). The correlation of the results from VFQ-25 and the binocular visual acuity was moderate (Spearman's  $r = 0,6$ ;  $p < 0,01$ ). The application of questionnaires for assessment of visual function may contribute to the identification of less known and sought subclinical visual dysfunctions that appear in normal visual acuity. Our data confirm the possible usage of VFQ-25 and MSVQ-7 for effective measurement of the subjective visual deficit in MS diagnosis.

**Key words:** multiple sclerosis, visual questionnaires, visual dysfunction, visual acuity, early diagnosis

## INTRODUCTION

Multiple sclerosis (MS) may have a considerable and extended negative effect on the patient's quality of life. This inflammatory demyelinating disease of the central nervous system arising in relatively young people aged between 20 and 40 years sometimes provokes chronic and heavy disability. The motion deficit is usually cited as the most frequent cause for deterioration of quality of life. Its impact in this case may not be entirely proved by the common assessment of the neurological disturbances. Less attention is paid to the visual dysfunction, especially the subjective, usually subclinical visual dysfunction in MS patients leading to difficulties in daily activity (1,7,14). In some cases patients do not manage to characterize it, especially when visual discomfort is present with normal visual acuity ( $\geq 1,0$ ). In the so-called subclinical visual dysfunction the patients' explanations are usually limited to: 'There is something with my eyes', 'washed-out', or 'blurred vision' (3,6,8). During the last few years, the question for the limited possibilities for

assessment and measurement of this subjective complaint has become topical in the literature. In addition to the scales for evaluation of the neurological deficit of MS patients (among which the most commonly used is the expanded disability status scale, EDSS) and of quality of life, HRQOL (Health Related Quality of Life), a MS specific appendix, MSQLI (MS Quality of Life Inventory) was developed. Only through HRQOL and MSQLI scales it is possible to establish how health problems reflect on patient's abilities and activities and to objectify patient's views on the impact of the disease or the treatment. MSQLI contains a part of the basic questions of HRQOL and nine other scales related to different symptoms and aspects of the quality of life, including a scale for the visual dysfunction essential for MS patients. Notwithstanding with MSQLI development, the US NEI questionnaire for the visual function (NEI-VFQ) and its short variation VFQ-25 (25-item Vision Function Questionnaire) are an important contribution in the information for the visual function measurement with relation to the quality of life of MS patients. Though these tests are not MS-specific, studies show a certain correlation with other visual dysfunction investigation methods such as visual acuity, visual fields, contrast sensitivity, and colour vision, especially when the diagnosis of MS is definite and the visual acuity is damaged. As a MSQLI subscale, VFQ-25 and MS-specific question for visual

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function which is attached to it are sufficiently effective in measuring the existing subjective visual dysfunction in MS. According to some authors, the so-modified VFQ-25 would increase the possibility to document and objectify the subclinical visual dysfunction in MS. The possibility VFQ-25 and other more MS-specific questionnaires to be included in the commonly accepted clinical scales for evaluation of disability in MS is widely discussed in the literature (2,4,5,9-13,15).

The present study aims at revealing the subjective visual dysfunction of MS patients using the 25-item National Eye Institute Visual Function Questionnaire (NEI VFQ-25) translated into Bulgarian and the short MS-specific questionnaire, MSVQ-7 and at assessing the questionnaire correlation with the binocular visual acuity.

## MATERIAL AND METHODS

### Subjects

VFQ-25 was administered to 108 subjects with clinically definite MS randomly selected among 150 patients initially hospitalized in the 1<sup>st</sup> Clinic of Neurology, St. Marina University Hospital of Varna, and dynamically followed-up in MS-Centre of Varna, and to 30 healthy controls. There were 31 men and 87 women aged  $39,34 \pm 11,59$  years with average duration of MS of 5,7 years and binocular visual acuity 0,5. This single crosscut study covered 63 patients with no history of optic neuritis (ON) and 45 ones after ON (9 in acute phase and 36 after ON). In all cases a routine neuro-ophthalmological examination was performed including visual acuity test. EDSS average score was 3,4. Sixty 60 MS patients (30 with no history of ON and 30 after ON) and 30 controls were interviewed with the short MS-specific questionnaire. The controls were selected after a routine neuro-ophthalmological test among the staff of 1<sup>st</sup> and 2<sup>nd</sup> Clinic of Neurology and students from Prof. Paraskev Stoyanov Medical University of Varna.

Table 1. VFQ-25 - Subscales

General health (1 question)
General vision (1 Q.)
Ocular pain (2 Q.)
Near activities (3 Q.)
Distance activities (3 Q.)
Vision specific:
- Social functioning (2 Q.)
- Mental health (4 Q.)
- Role difficulties (2 Q.)
- Dependency (2 Q.)
- Driving (2 Q.)
- Colour vision (1 Q.)
- Peripheral vision (1 Q.)

Thirty subjects were examined, all aged  $37,77 \pm 12,35$  (9 men and 21 women) with no data for disease of eyes, visual pathways, or central nervous system. The present refraction anomalies were corrected to  $\geq 1,0$ .

### Methods

**Questionnaires.** Each patient and disease-free subject was interviewed using the VFQ-25. It represents a short version of the 51-item Questionnaire for visual function examination and is standardized for visual-specific evaluation of quality of life among different groups of patients with neurological diseases including MS (4). VFQ-25 includes 25 questions divided in 12 subscales (Table 1) that reflect the level of visual difficulties and the related restrictions in everyday activities evaluated by a scale from 1 to 5 or 6, where 5 or 6 is the lowest level of function. The answers of the questions are consistent with the correction needed for every subject with glasses or contact lenses. VFQ-25 was administered in accordance with standard instructions and the results were processed according to the algorithm: the 25 questions were scaled from 0 to 100, where 100 were the highest function level. The composite result was calculated as an average value of all answers for every patient excluding the subscale concerning the overall health status.

The short MS-specific questionnaire, MSVQ-7, is presented on Table 2. The answers were evaluated using a scale from 0 ('This aspect of vision is not applicable to me'), 1 - 'No problem' to 4 - 'Severe problem' and the results were processed and scaled from 0 to 100, where 100 were the highest function level.

Table 2. MSVQ-7 visual symptoms or activity

1. Difficulty with vision when your eyes are tired
2. Difficulty with your vision in bright sunlight
3. Feeling that your two eyes see differently
4. Difficulty looking at or using a computer
5. Feeling that your vision is blurry, not clear, or "fuzzy"
6. Trouble focussing on or following moving objects
7. Double vision

**Visual acuity.** The binocular visual acuity with high contrast was examined by a projected numerical table. The test was binocular, thus, after the required correction, in accordance with the commonly accepted opinion that in this way except the minimization of the fatigue, the different aspects of vision loss related to the everyday activities are most adequately specified. The numbers from the table were listed one by one (max 54 numbers), and the respective Snellen visual acuity was calculated (max 1,5).

**Statistical analysis.** The mean scores and standard deviations were calculated for every VFQ-25 subscale and for one composite result. The values obtained from the group of MS patients were compared with those of the controls by

using two-tailed *t*-test. The mean score and the standard deviations of the answers to each of the 7 questions from MSVQ-7 were calculated. Patients' and healthy subjects' answers were compared through two-sample non-parametrical analysis of Kolmogorov-Smirnov's and Mann-Whitney's *U*-test. The correlation between the total result from VFQ-25 and the visual acuity calculated on the basis of the number of identified characters in the group of patients was established through Spearman's correlation analysis.

## RESULTS AND DISCUSSION

There was a statistically significant difference ( $p < 0,0001$ ) between MS patients and controls in all subscales and in the total result from VFQ-25. The level of significance ( $p = 0,001$ ) was highest in the subscale reporting the colour vision, but not enough for the hypothesis to be rejected. Mean scores and standard deviations of the total result and the results from the 12 subscales among the groups of MS patients and controls are shown on Table 3.

Table 3. Mean scores and standard deviations from the general results and the results from the 12 sub-scales of the groups of patients with MS and controls

VFQ-25 - subscales	Patients with MS	control subjects	$p <$
Composite VFQ-25 result	79,53±9,83	95,97±3,10	0,0001
General health	56,94±18,98	86,67±16,75	0,0001
General vision	73,33±20,09	90,67±12,36	0,0001
Ocular pain	66,19±14,91	92,3±9,25	0,0001
Near activities	81,83±11,85	96,13±6,74	0,0001
Distance activities	79,78±13,19	95,3±7,96	0,0001
Social functioning	84,46±12,53	99,2±2,99	0,0001
Mental health	82,29±11,21	95,967±4,31	0,0001
Role difficulties	80,46±12,08	98±4,47	0,0001
Dependency	80,35±11,67	98,67±2,98	0,0001
Driving	74±19,04	91,73±8,01	0,0001
Colour vision	90,05±14,48	97,5±7,50	0,001
Peripheral vision	78,24±21,64	98,33±6,24	0,0001

The analysis of MSVQ-7 showed a statistically significant difference between the answers of question Nos 1, 2, 3 and 5 ( $p < 0,001$  to  $p = 0,015$ ). The results for question No 4 about the difficulties when working with a computer were not subject to analysis because of the significant number of answers 'This aspect of vision is not applicable to me'. Correlation analysis showed a statistically insignificant difference in the answers of question 6 and 7 between controls and MS patients. The statistically significant difference for these an-

swers obtained by the Mann-Whitney *U*-test which required identical statistic distribution of both samples was rejected when the Kolmogorov-Smirnov's test was applied. In 76% of the patients a visual acuity of 1,0 or better was reported. The correlation of the total result of VFQ-25 with the examined binocular visual acuity (based on the number of correctly identified digits) was moderate (Spearman's  $r = 0,6$ ;  $p < 0,01$ ).

Table 4. Non-parametric analysis of the MSVQ-7 answers with two samples (controls and patients) Mann-Whitney's *t*-test

	Mann-Whitney <i>U</i>	P
difficulty with vision when your eyes are tired	472.50	.000
difficulty with your vision in bright sun-light	507.00	.000
feeling that your two eyes see differently	580.50	.000
difficulty looking at or using a computer	715.00	.234
feeling that your vision is blurry, not clear, or "fuzzy"	431.00	.000
trouble focusing on or following moving objects	699.00	.022
double vision	750.00	.019

Table 5. Non-parametric analysis of the MSVQ-7 answers with two samples (controls and patients) (Kolmogorov-Smirnov's *U*-test)

	Kolmogorov-Smirnov Z	P
difficulty with vision when your eyes are tired	1.938	.001
difficulty with your vision in bright sun-light	1.640	.009
feeling that your two eyes see differently	1.565	.015
difficulty looking at or using a computer	.988	.283
feeling that your vision is blurry, not clear, or "fuzzy"	2.162	.000
trouble focusing on or following moving objects	.969	.305
double vision	.745	.635

The average values of VFQ-25 subscales and the calculated total result in MS patients were considerably lower than these of the controls. The largest value of significance level ( $p=0,001$ ) was obtained in the subscale for colour vision where there only one question was included: 'How much difficulty do you have picking out and matching your own clothes?' We join the commonly accepted opinion in the literature that the question formulated in this manner may not always capture the frequent, though fine, troubles of colour vision in MS (9).

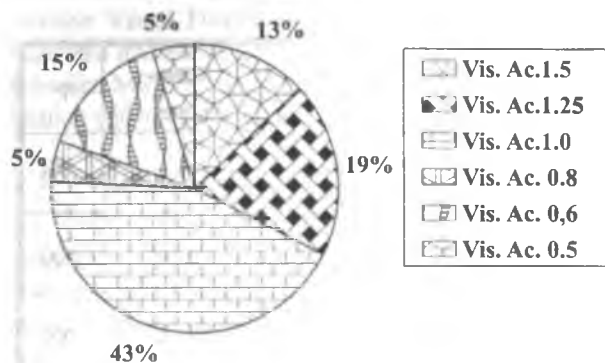


Fig. 1. Percentage distribution of the visual acuity among the patients examined

The statistically significant difference between the answers of question Nos 1, 2, 5 of MSVQ-7 ( $p<0,001$  to  $p=0,009$ ) confirms the possibility to objectify subclinical visual disturbances in MS through this specific questionnaire. The lack of statistically significant difference in the answers to question No 7 between the group of patients with MS and the controls could be explained with the effectuated cross-sectional study, i.e. by the moment of study there was a small number of patients with double vision. After processing the VFQ-25 results, important differences were reported, though in MS patients the mean score of the binocular visual acuity was 1,0 or better. This is why MS patients even with normal visual acuity when compared with the controls demonstrated a high level of subjective visual dysfunction evaluated using VFQ-25. A range of studies prove that in MS there is an important subjective dysfunction that may not be established only by tests of visual acuity with high contrast, a parameter that is traditionally present in the scales for disability evaluation in MS (2,3,8). The application of questionnaires for assessment of the visual function may contribute to the identification of these less known and sought subclinical visual dysfunctions appearing with normal visual acuity. The inclusion of VFQ-25 in the clinical scales for disability evaluation in MS in order to objectify more precisely the slight visual dysfunction in this disease is widely discussed. The addition of several questions more specific to MS (MSVQ-7) is proposed in order to obtain useful information for future studies of the visual dysfunction in MS (2,3,9). Our study confirms that both VFQ-25 and MSVQ-7 can be used for more effective measurement of the subjective visual deficit in the diagnosis of MS.

## REFERENCES

- Ashworth, B., P. A. Aspinall, J. D. Mitchell. Visual function in multiple sclerosis.- *Doc. Ophthalmol.*, 73, 1989, No 3, 209-224.
- Balcer, L. J., M. L. Baier, A. M. Kunkle, et al. Self-reported visual dysfunction in multiple sclerosis: results from the 25-item National Eye Institute Visual Function Questionnaire (VFQ-25).- *Mult. Scler.*, 6, 2000, 382-385.
- Balcer, L. J. Clinical outcome measures for research in multiple sclerosis.- *J. Neuroophthalmol.*, 21, 2001, No 4, 296-301.
- Cole, S. R., R. W. Beck, P. S. Moke, et al. The National Eye Institute Visual Function Questionnaire (NEI-VFQ): experience of the ONTT.- *Invest. Ophthalmol. Vis. Sci.*, 41, 2000, 1017-1021.
- Fischer, J. S., N. G. LaRocca, D. M. Miller, P. G. Ritvo, H. Andrews, D. Paty. Recent developments in the assessment of quality of life in multiple sclerosis.- *Mult. Scler.*, 5, 1999, 251-259.
- Kupersmith, M. J., J. I. Nelson, W. H. Seiple, et al. The 20/20 eye in multiple sclerosis.- *Neurology*, 33, 1983, 1015-1020.
- Kurtzke, J. F. Rating neurologic impairment in multiple sclerosis: an expanded disability status scale (EDSS).- *Neurology*, 33, 1983, 1444-1452.
- Lycke, J., P. O. Tolleson, L. Frisen. Asymptomatic visual loss in multiple sclerosis.- *J. Neurol.*, 248, 2001, No 12, 1079-1086.
- Ma, S-L., J. A. Shea, S. L. Galetta, et al. Self-reported visual dysfunction in multiple sclerosis: new data from the VFQ-25 and development of an MS-specific vision questionnaire.- *Am. J. Ophthalmol.*, 133, 2002, No 5, 686-692.
- Mangione, C. M. The National Eye Institute 25-Item Visual Function Questionnaire-scoring algorithm. 1997.
- Mangione, C. M., S. Berry, K. Spritzer, et al. Identifying the content area for the 51-item National Eye Institute Visual Function Questionnaire: results from focus groups with visually impaired persons.- *Arch. Ophthalmol.*, 116, 1998, 227-233.
- Mangione, C. M., P. P. Lee, J. Pitts, P. Gutierrez, S. Berry, R. D. Hays, for the NEI-VFQ Field Test Investigators. Psychometric properties of the National Eye Institute Visual Function Questionnaire (NEI-VFQ).- *Arch. Ophthalmol.*, 116, 1998, 1496-1504.
- Mangione, C. M., P. P. Lee, P. R. Gutierrez, K. Spritzer, S. Berry, R. D. Hays. Development of the 25-item National Eye Institute Visual Function Questionnaire.- *Arch. Ophthalmol.*, 119, 2001, No 7, 1050-1058.
- McDonald, W. I., D. Barnes. The ocular manifestations of multiple sclerosis. I. Abnormalities of the afferent visual system.- *J. Neurol. Neurosurg. Psychiat.*, 55, 1992, 747-752.
- Optic Neuritis Study Group. Visual Function More Than 10 Years After Optic Neuritis: experience of the Optic Neuritis Treatment Trial.- *Am. J. Ophthalmol.*, 137, 2004, 77-83.