

# Validity and reliability study for the NEI-VFO-39 scale in chronic ophthalmic diseases – Turkish version

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## ABSTRACT.

**Purpose:** To test the reliability and validity of National Eye Institute Visual Function Questionnaire (NEI-VFQ-39) in patients with glaucoma, cataract, diabetic retinopathy and age-related macular degeneration.

**Methods:** The study was carried out on 210 patients and 51 control subjects. The data were collected by using a data collection form and NEI-VFQ-39. Statistical analyses were performed with spss for Windows version 15.0.

**Results:** Cronbach's alpha coefficient was 0.96 for the whole group. Cronbach's alpha coefficient was between 0.97 and 0.56 for the subscales. There was a strong relationship ( $r > 0.80$ ) in 12.8% with dual correlation in NEI-VFQ-39 global scales and subscales and their correlations in all participant groups. There was a statistically significant difference for the NEI-VFQ global and subscale scores between the control and patient groups except for general health and ocular pain.

**Conclusions:** We found that the NEI-VFQ-39 was a valid and reliable scale to determine the quality of life in Turkish patients with chronic ophthalmic disease.

**Key words:** age-related macular degeneration – cataract – diabetic retinopathy – glaucoma – quality of life

Acta Ophthalmol. 2010; 88: e115–e119

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doi: 10.1111/j.1755-3768.2009.01810.x

## Introduction

Quality of life (QOL) is a subjective perception and varies from person to person (Mitchell & Bradley 2006). The World Health Organization has defined QOL as a person's perceptions, life, culture, the value systems

they use, expectations, standards and interests (WHO 2009).

Reliable, valid and sensitive scales are necessary to evaluate the effect of vision on QOL. The US National Eye Institute (NEI) has supported the development of a scale to investigate important concepts for patients with

chronic eye diseases, such as senile cataract, age-related macular degeneration (AMD), glaucoma, diabetic retinopathy and cytomegalovirus retinitis (Nordmann et al. 2004). Quality of life measurements related to ophthalmic patients were initially created to determine surgical interventions such as cataract surgery. They have also been used to measure the satisfaction of patients with ocular diseases such as glaucoma and optic neuritis (Wolfssohn et al. 2000).

The original version of the National Eye Institute Visual Function Questionnaire (NEI-VFQ) consists of 51 items (Mangione et al. 1998a; Mangione et al. 2001). NEI-VFQ-25 is the short form of the NEI-VFQ scale and was especially developed for chronic eye diseases (Owsley & McGwin 2004; Cusick et al. 2005; Spaeth et al. 2006). The NEI-VFQ-25 has a more holistic approach to eye patients compared to health-related QOL measurements. It also helps to evaluate the effect of visual function on emotional and social functions (Sharma et al. 2005).

The NEI-VFQ-39 scale was developed by adding 14 items to the NEI-VFQ-25 to obtain additional information on the vision-related QOL of patients (Clemons et al. 2003). The validity of the NEI-VFQ

scale has previously been proven in studies with various ophthalmic patients (Mangione et al. 1998b; Clemons et al. 2003).

## Materials and Methods

### Patient population and inclusion and exclusion criteria

The study was carried out at the Ophthalmology Department of a military hospital in Turkey between 1 May and 31 August 2006. Patients receiving treatment or being followed for the diagnoses of glaucoma, cataract, diabetic retinopathy and AMD were included. Patients with other ophthalmic problems such as cornea or optic nerve diseases, or having more than one of these disorders concomitantly were excluded. We determine sample size by using Power and Sample Size Calculation V 2.1. We used previous study results as tests mean standard deviation estimations and found that we need least 38 subject each groups (Glaucoma, Cataract, diabetic retinopathy (DR), age-related macular degeneration (ARMD), Control) (Avci 2005). The study was carried out on total 210 patients and 51 control subjects. The control group was selected from routine ophthalmic examination cases and several clinical staff members who did not have a diagnosis, suspicion or family history of chronic eye disease. The data were collected using a questionnaire involving questions on patients' specific characteristics and the National Eye Institute Visual Function Questionnaire-39 NEI-VFQ-39. The data collection form and NEI-VFQ-39 were applied to patients with the face-to-face interview method.

### Translation

The standard forward-backward procedure was applied to translate NEI-VFO-39 from English into Turkish. Two native Turkish people who speak English fluently translated the questionnaire independently. The two translators then met to agree to a common pilot version. This version was translated back into English by an English teacher who speaks both English and Turkish fluently. The back translation was compared to the original NEI-VFO-39 by the English

teacher and an ophthalmologist after final version was provided.

### Statistical analyses

Statistical analyses were performed with SPSS for Windows version 15.0. Descriptive analyses were presented as mean  $\pm$  SD and as a number (%). Chi-squared test, Independent Samples *t*-test and one-way variance analysis were used to compare groups, while the Dunnett test was used as a post hoc test for variance analysis. The Cronbach's alpha coefficient and average measures interclass correlation coefficient were used to evaluate internal consistency of scale.

### Quality of life assessment

Quality of life of the patients was evaluated according to NEI-VFQ-39. The NEI-VFQ-39 contains 12 subscales that assess the impact of eye conditions and visual problems on general health: general vision, ocular pain, colour vision, near activities, distance activities, social function, mental health, role difficulties, dependency, driving and peripheral vision. Scores for the NEI-VFQ-39 overall and for each of the subscales can range from 0 to 100, with 100 indicating no disability.

### Ethical issues

We obtained permission for the study first by applying to the Gulhane Military Medical Academy (GMMA) local ethic committee. Informed consent was obtained from all patients.

## Results

Mean age of the study group was  $64 \pm 13$  years, and mean age of the control subjects was  $55 \pm 10$  years. The study and control groups comprised mostly married people, primary school graduates and females. There was no significant difference between the study and control groups with regard to the parameters of age, gender, education level and living alone ( $p > 0.05$ ) (Table 1).

Table 2 presents the total scores and subscores of the study group according to their diseases. Comparison of the subscores of the study group and the control group revealed a significant difference between total scores of scale apart from ocular pain. Advanced analysis revealed that the difference for the subscales in the study groups was derived from the statistically significant difference between study and control group regarding the diabetic retinopathy for general health, study and control group regarding the AMD and study and control group regarding the cataract for driving and study and control group regarding the glaucoma for peripheral vision. The other differences were because of the mean scores of the subscales for each disease in the study and control group.

Table 3 shows that the Cronbach's alpha coefficient was 0.96 for the whole group. A validity analysis for the subscales in the table revealed that the driving subscale had the highest reliability, followed by near sight and role difficulties. The lowest validity was for the ocular pain subscale.

**Table 1.** Distribution of some socio-demographic variables of subjects.

Characteristics	Patient group	Control group	p
	(n = 210)	(n = 51)	
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Age(years)	64 $\pm$ 15	55 $\pm$ 10	0.078*
Gender			
Female, n (%)	114 (54.3)	34 (66.7)	0.109 <sup>†</sup>
Male, n (%)	96 (44.9)	17 (33.3)	
Education level			
Primary school, n (%)	126 (60.0)	34 (66.6)	0.432 <sup>†</sup>
High school, n (%)	46 (21.9)	7 (13.7)	
University, n (%)	38 (18.1)	10 (19.6)	
Living alone			
No, n (%)	183 (87.1)	45 (88.2)	0.833 <sup>†</sup>
Yes, n (%)	27 (12.9)	6 (11.8)	

\**t*-test.

<sup>†</sup>Chi-square.

**Table 2.** Mean scores of the subscales and the scale of study and control groups according to ophthalmic diseases.

Subscales	Glaucoma	Cataract	DR	ARMD	Control	p*
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Total	66.0 ± 17.2	53.7 ± 20.1	61.6 ± 20.1	56.8 ± 19.0	77.8 ± 11.1	0.001
General health	52.5 ± 15.4	51.5 ± 16.6	47.4 ± 16.3	56.0 ± 17.0	57.2 ± 14.0	0.022
General vision	53.2 ± 16.0	42.4 ± 16.2	47.2 ± 13.7	43.0 ± 15.5	65.3 ± 13.2	0.000
Ocular pain	73.0 ± 23.0	67.5 ± 25.1	74.7 ± 25.0	72.9 ± 21.1	71.0 ± 26.1	0.654
Near activities	66.2 ± 29.9	50.7 ± 29.1	57.3 ± 29.8	47.8 ± 29.1	81.1 ± 16.2	0.001
Distance activities	63.2 ± 24.7	47.4 ± 24.3	58.8 ± 27.6	51.5 ± 25.4	63.2 ± 24.7	0.001
Vision-specific social function	82.4 ± 25.2	66.1 ± 32.4	77.9 ± 26.0	68.0 ± 25.6	82.4 ± 25.2	0.001
Vision-specific mental health	73.5 ± 24.5	60.0 ± 24.6	66.9 ± 25.9	63.6 ± 25.7	73.5 ± 24.5	0.001
Vision-specific role difficulties	66.1 ± 27.4	48.61 ± 25.1	61.7 ± 26.4	53.1 ± 29.7	66.1 ± 27.4	0.001
Dependency	83.3 ± 24.9	66.2 ± 31.03	80.0 ± 27.8	74.4 ± 26.4	83.3 ± 24.9	0.001
Driving	16.3 ± 34.4	10.1 ± 26.9	16.4 ± 35.2	9.5 ± 24.4	27.9 ± 41.1	0.048
Color vision	90.2 ± 21.9	74.4 ± 30.3	82.8 ± 26.3	84.3 ± 22.8	99.5 ± 3.5	0.001
Peripheral Vision	72.8 ± 30.5	59.4 ± 29.3	67.7 ± 27.7	57.2 ± 29.1	84.8 ± 21.2	0.001

\*One-way ANOVA.

**Table 3.** Internal consistency for NEI-VFQ 39 subscales (all participants).

Subscales	Number of items	Items	Cronbach's alpha	ICC	p
				Correlation coefficient* (95% CI)	
Total	39		0.96		
General health	2	1,A1	0.81	0.81 (0.76–0.85)	<0.001
General vision	2	2,A2	0.78	0.78 (0.72–0.82)	<0.001
Ocular pain	2	4,19	0.56	0.56 (0.44–0.65)	<0.001
Near activities	6	5,6,7,A3,A4,A5	0.90	0.90 (0.88–0.91)	<0.001
Distance activities	6	8,9,14,A6,A7,A8	0.80	0.80 (0.76–0.84)	<0.001
Vision-specific social function	3	11,13,A9	0.79	0.79 (0.74–0.83)	<0.001
Vision-specific mental health	5	3,21,22,25,A12	0.83	0.83 (0.79–0.86)	<0.001
Vision-specific role difficulties	4	17,18,A11A,A11B	0.89	0.89 (0.87–0.91)	<0.001
Vision-specific dependency	4	20,23,24,A13	0.86	0.86(0.83–0.88)	<0.001
Driving	3	15C,16,16A	0.97	0.97 (0.97–0.98)	<0.001
Color vision	1		NA	NA	NA
Peripheral vision	1		NA	NA	NA

ICC = interclass correlation; 95% CI = 95 percent confidence interval.

\*Average measures ICC coefficient.

**Table 4.** Distribution of the mean scores of the subscales.

Subscales	Control group (n = 51)	Study group (n = 210)	p*
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	
Total	77.8 ± 11.1	60.3 ± 19.4	0.001
General health	57.2 ± 14.0	51.9 ± 16.4	0.035
General vision	65.3 ± 13.2	47.2 ± 16.0	0.001
Ocular pain	71.0 ± 26.1	72.2 ± 23.5	0.765
Near activities	81.1 ± 16.2	56.6 ± 30.2	0.001
Distance activities	77.0 ± 18.9	56.1 ± 26.1	0.001
Vision-specific social function	95.9 ± 10.8	74.6 ± 27.9	0.001
Vision-specific mental health	91.1 ± 12.4	66.8 ± 25.5	0.001
Vision-specific role difficulties	85.5 ± 17.2	58.3 ± 27.9	0.001
Vision-specific dependency	96.9 ± 7.0	76.9 ± 27.8	0.001
Driving	27.9 ± 41.1	13.4 ± 31.0	0.006
Color vision	99.5 ± 3.5	83.8 ± 25.6	0.001
Peripheral vision	84.8 ± 21.2	65.2 ± 29.8	0.001

\*Independent Samples t-test.

Cronbach's alpha coefficient was between 0.97 and 0.56 for the subscales.

Table 4 compares the NEI-VFQ-39 global and subscale scores of the control and study group. There was a sta-

tistically significant difference between the two groups except for ocular pain.

Table 5 compares the descriptive characteristics of some patients with ocular disease and the total mean score of QOL. It shows that there is a statistically significant difference for global score averages between the various age groups in patients with glaucoma, whereas there was no statistically significant difference in the other groups and in the control group. Advanced analysis revealed that the difference was derived from the patients who are in the age of 59 or under and in the age of 70 and over. There was no statistically significant difference in the study groups between marital status and living alone and the scale global point averages. There was a statistically significant difference between patients having DR and cataract according to

**Table 5.** The distribution of mean scores of the subscales according to some socio-demographic characteristics of the study and control groups and ocular diseases.

Characteristics	Glaucoma	Cataract	DR	ARMD	Control
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
Age					
≤59	74 ± 11	56 ± 22	65 ± 21	69 ± 14	80 ± 11
60–69	66 ± 20	55 ± 22	59 ± 19	61 ± 20	73 ± 10
≥70	61 ± 17	52 ± 19	55 ± 19	53 ± 19	73 ± 9
p*	0.034	0.838	0.380	0.113	0.134
Gender					
Male	68 ± 20	65 ± 17	71 ± 17	59 ± 20	86 ± 8
Female	65 ± 15	45 ± 18	55 ± 20	55 ± 19	74 ± 10
p†	0.353	0.001	0.005	0.476	0.000
Marital status					
Married	66 ± 17	56 ± 22	62 ± 20	57 ± 19	77 ± 11
Unmarried	64 ± 21	44 ± 7	62 ± 22	57 ± 22	83 ± 8
p†	0.718	0.054	0.981	0.897	0.454
Education level					
Primary school	63 ± 17	47 ± 18	54 ± 20	52 ± 19	76 ± 11
High school	68 ± 19	75 ± 9	71 ± 20	60 ± 21	85 ± 9
University	73 ± 15	73 ± 11	71 ± 13	63 ± 15	80 ± 12
p*	0.073	0.000	0.009	0.287	0.144
Living alone					
Yes	65 ± 19	43 ± 8	56 ± 23	61 ± 20	77 ± 9
No	66 ± 17	55 ± 21	62 ± 20	56 ± 19	78 ± 11
p†	0.874	0.207	0.600	0.373	0.700

\*One-way ANOVA.

†Independent Samples *t*-test.

gender whereas there was no statistical difference in patients with different ocular diseases.

Advanced analysis demonstrated that there was a statistically significant difference for the total mean scores according to educational level of patients having DR and cataract. There was no statistical difference according to educational levels of patients having other ocular diseases. The difference between patients having DR and cataract according to educational level was derived from difference between group elementary and group high school and group elementary and group baccalaureate.

## Discussion

Quality of life measures are objective evaluations which give an indication as to how much the patient perceives the disease affects his day-to-day living (Gupta et al. 2005). In this study, we proposed to evaluate the reliability and validity of the Turkish version of the NEI-VFQ-39.

Mangione et al. (1998b) studied the validity and reliability of the 51-item NEI-VFQ scale in patients with various chronic eye disorders (age-related cataracts, AMD, diabetic retinopathy,

primary open-angle glaucoma and cytomegalovirus retinitis). The Cronbach's alpha coefficients of the subscales were 0.66–0.94 and usually higher than 0.70. The NEI-VFQ-25 subscale values were 0.71–0.85 in the study by Mangione et al. (2001). Clemons et al. (2003) found a Cronbach's alpha coefficient of 0.58–0.91 for the NEI-VFQ subscales and concluded that internal consistency was efficient. They reported that all scale items had a moderate degree of internal consistency and reliability.

In our study, the subscale Cronbach's alpha coefficient ranged between 0.56 and 0.97. Subscales, other than ocular pain, had a reliability of more than 0.70. The lowest rate is for ocular pain. Cronbach's alpha coefficient of 0.70 or higher is accepted as good reliability. Our results are similar to others (Cole et al. 2000; Rossi et al. 2003; Nordmann et al. 2004; Berdeaux et al. 2005; Suzukoma et al. 2005; Baker et al. 2006). There was a significant correlation between the total mean scores and the mean scores of the subscales. The global scales showed less correlation with driving, general health and ocular pain compared to distance vision and near vision. This result is similar to that of Nordmann et al. (2004).

## Validity

Table 4 shows the mean scores of the subscales and the total mean scores of the study group. Comparison of the two groups revealed a statistically significant difference between the groups except for ocular pain and general health. This result is similar to that of Rossi et al. (2003). Our result has demonstrated that the NEI-VFQ-39 scale enables differentiation when determining QOL of ocular patients.

In our study, the highest correlation between the subscales in the study group was between near activity and distance activity, while the lowest correlation was between colour vision and driving subscales. Rossi et al. (2003) found high correlation for scales including distance and near vision and low correlation for scales with a vision-target physical dimension such as ocular pain. Suzukoma et al. (2005) also reported that the patients with glaucoma received the highest mean scores (69.8) from the NEI-VFQ-25 global score. Jampel et al. (2002) reported NEI-VFQ-25 total mean score of 77.3 ± 15.5 for their patients with glaucoma. Our results are also consistent with this study. The highest total mean score of the NEI-VFQ-39 scale was in the glaucoma group.

For the participants in our study, the lowest total mean score from the NEI-VFQ-39 was 53.7 ± 20.1 for patients having cataract. The highest mean score of the subscales belong to the patients with glaucoma. The score obtained was lower than that found in studies from other countries (Zhao et al. 1998). Slakter & Stur (2005) have reported that the support and coping mechanisms of those participating in studies differ from region to region. They have emphasized that this difference has a profound effect on the subjective evaluation of patient status. In addition, the participants were from one regional area where the coping or support mechanisms might be unique or more effective than in other communities. This would have a potentially profound impact on the participants' subjective assessments of their situation (Slakter & Stur 2005).

There are various factors that might be expected to affect the impact of a disease state on the QOL of a patient, such as duration of disease, educational qualifications, patient's age,



gender, socioeconomic status, whether the disease is acute or chronic and psychological variations among individuals (Gupta et al. 2005). We evaluated QOL in individuals with chronic eye diseases. We also evaluated characteristics that could affect the QOL, such as age, gender, marital status, education and occupation. Our study group is older than the patients that are mentioned in the other studies. Other studies have also reported that chronic ocular disease is seen in the age of 46 and older (Rossi et al. 2003; Nordmann et al. 2004; Toprak et al. 2005). We found that the total mean scores decreased with age and that this difference was significant in the glaucoma group. Nordmann et al. (2004) have studied patients with ocular hypertension and glaucoma and found that males had higher scores than women for general vision, driving, ocular pain, role difficulty and mental health. The same study reported that the general health and general vision scores decreased with age. Lau et al. (2002) studied QOL in patients who had undergone cataract surgery and found a much higher visual function and vision-related QOL in the 60–69 and 70–79 age groups compared to the patients of 80 years of age and older. Another study reported that decreasing vision in glaucoma patients most frequently caused problems with reading, climbing stairs and recognizing others, and that these affected the elderly more than younger patients (Odberg et al. 2001). Berdeaux et al. (2005) found that the effect on QOL of the visual disturbance in ARMD patients increased with age. In their age-related eye disease study, Clemons et al. (2003) found that the total mean score and mean scores of the subscales for the NEI-VFQ scale were lower in participants younger than the age of 70 compared to participants over 75. In contrast to all these studies, a study on the effect of macular degeneration on QOL found no relation between age and the score received from the impact of vision impairment questionnaire (IVI) (Hassell et al. 2006).

The QOL women was found lower than the QOL men in our study. It is declared in the literature that the life quality of the women who have eye illnesses is lower (Avci 2005; Swamy et al. 2009). This situation results from the diversity of stressing events

women and men experience. The facts that women have to change their lifestyles more frequently because of chronic diseases, they encounter more problems in their marriages than men and that they are obliged to sustain their traditional roles within the family may effect their QOL (Avci 2005). It is evaluated in our study as well that female patients have a lower QOL for these reasons.

## Conclusion

We found that the NEI-VFQ-39 scale was a valid and reliable scale to determine QOL in Turkish patients with chronic ophthalmic disease such as DR, cataract, glaucoma and ARMD.

## Limitations

We could not perform retest because most of our patients were outpatient and live in cities other than the city where the study is conducted.

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Received on January 21st, 2009.

Accepted on October 16th 2009.

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