

Vision-Related Quality of Life after Corneal Transplantation

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Abstract

Purpose: To determine the vision-related quality of life (VR-QoL) and its dimensions in corneal transplant recipients.

Methods: This cross-sectional study was carried out on 100 patients who underwent penetrating keratoplasty. Data collection tools included a demographic questionnaire, satisfaction questionnaire, and Persian version of the 39-item National Eye Institute Visual Functioning Questionnaire (NEI-VFQ 39).

Results: The composite score of VR-QoL in corneal transplant recipients was 54.39 ± 9.22 (32.9–71.01). The highest mean score among subscales was related to color vision (74.75 ± 27.63) and the lowest related to dependency (31.06 ± 31.02). The results showed that there is a reverse correlation between VR-QoL with both age ($r = -0.364$; $P < 0.001$) and the numbers of years after the transplantation ($r = -0.362$; $P < 0.001$). However, there was a correlation between satisfaction and VR-QoL ($r = 0.679$; $P < 0.001$). Furthermore, the results showed that there is a significant difference in VR-QoL between men and women ($P < 0.001$) and also a significant difference in VR-QoL between unilateral and bilateral graft recipients ($P < 0.001$).

Conclusions: The corneal transplant has the highest impact on color vision and the lowest on dependency. Moreover, the results of this study provide a comprehensive picture for the state of vision and overall health status of patients for health-care providers to enhance the patient care.

Keywords: Corneal transplantation, Satisfaction, Vision-related quality of life

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INTRODUCTION

Corneal transplantation is one of the most common transplanted tissues in the world and is known as one of the most successful types of tissue graft around the world.^{1,2} Currently, ten million people worldwide are suffering from eye diseases that are treatable only by corneal transplantation.³ Blindness caused by corneal problems is the world's third leading cause of blindness after cataract and glaucoma.⁴ In 2012, about 184,576 corneal transplants have been carried out in 116 countries,⁵ of which 50,000 cases have been carried out in the United States,⁶ 2,500 in the United Kingdom,⁷ and 3,000 in Iran.⁸

With regard to the patient-centered approach of the health-care system, the patient opinion is an important factor in the evaluation of the clinical outcomes for the treatment; therefore, the subjective indices along with the objective indices have attracted much attention for assessment.⁹ Two concepts including quality of life (QoL) and vision-related QoL (VR-QoL) have been defined to perform the clinical evaluation. According to the World Health Organization (WHO), QoL defines as the individuals' perception of their position in life in the context of culture, society's values, expectations, and their own priorities. This issue is quite personal and cannot be observed by others.¹⁰ The VR-QoL is

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individuals' perception of their vision and daily life. Therefore, the assessment of VR-QoL provides an important criterion for evaluating the impact of therapeutic and care interventions of eye disease.¹¹

The outcomes of healthcare for transplant are classified by care providers, but the consequences may not be perceived completely by the patients. Nevertheless, transplant outcomes and its impacts on daily lives can only be assessed by patients. Hence, the results of these assessments can help provide better and high-quality care for patients.¹²

To assess the outcomes of corneal transplant, various tools such as questionnaire have been designed to rank the patients' concerns based on their judgment.¹¹ One of these tools is National Eye Institute Visual Functioning Questionnaire (NEI-VFQ), which is used in two interview-based and self-administered formats. The questionnaire has undergone psychometrics evaluation in the Persian language by Asgari *et al.*, so it can be used for Iranian patients.¹³

In addition, the questionnaire has been used in different studies to determine the VR-QoL score of patients with eye disease. For example, the VR-QoL score of patients with keratoconus in Turkey was 75.2 ± 17.2 ,¹⁴ 67.9 ± 17.5 ¹⁵ for patients with cataract surgery in Japan, and 76.5 ± 17 ¹⁶ for patients with ocular graft in the United States. In other studies, the patients' QoL score with different ranges of vision was calculated and compared using the questionnaire. The VR-QoL score of various patients with eye diseases such as cataract, glaucoma, and diabetic retinopathy has been calculated using the questionnaire in Iranian medical centers,¹⁷ but no assessment has been made, and calculated in corneal transplant recipients. Therefore, the main aim of this study was to explore and assess the VR-QoL and its various dimensions in corneal transplant recipients.

METHODS

This cross-sectional study was carried out on 100 corneal transplant recipients in teaching hospitals of Tehran (Farabi, Rasool Akram, Labbafinejad) in 2016. The study population included patients born and residing in Iran who underwent penetrating keratoplasty. To determine the required sample size, a 95% confidence level was selected with assumption that the accuracy of the VR-QoL estimation for the corneal transplant recipients at least $d = 3$, a sample size of 100 participants was obtained using the formula. Based on the previous study, the standard deviation of VR-QoL was estimated as 14.2,¹⁷ and convenience sampling was used to select the participants. Inclusion criteria consisted of those with at least 18 years of age, a history of corneal transplant in one or both eyes, receipt of a corneal transplant within the past 6 months, and the ability to communicate in the Persian language. The exclusion criteria included the absence of other systemic or ocular diseases that could potentially affect the vision. The purpose of the study was explained to the participants and they enrolled in the study after their written

consent. Finally, the participants were allowed to opt out of the study at any time. This study was conducted under the approval of the Ethics Committee of Tehran University of Medical Sciences (TUMS).

Data collection tools included a demographic questionnaire, satisfaction questionnaire, and Persian version of VFQ-39.^{12,13} A total of three questionnaires were completed by one of the researchers through interview, and the data were analyzed statistically using SPSS software version 16 (SPSS/IBM Inc., Chicago, Illinois, USA).

Researchers designated a demographic questionnaire based on valid scientific resources in relation to the objectives of the study. That questionnaire included questions about age, gender, marital status, education, occupation, income, family size, size of housing (m²), property status (owner or tenant), history of corneal transplant in one or both eyes, reason for corneal transplant, and the duration of eye disease that led to corneal transplant. Satisfaction questions consisted of the transplant satisfaction, fulfillment of expectations, consent or willingness for re-transplantation, the value of the transplant, and the related problems. The satisfaction score was measured as a quantitative variable by the summation of the score for five questions. Each question was scored 1 for "No" and "2" for "Yes" answers, and all questions were extracted from the research article by Fasolo *et al.* and approved by ten university professors.¹² In addition, test-retest was used to determine the reliability of the questionnaire. Thus, the questionnaire was completed by 20 recipients of corneal transplants, and 2 weeks later, it was completed again by these people. The test-retest reliability was obtained as 90%, and none of 20 patients enrolled in the study.

The VFQ-39 questionnaire had 39 questions about general health, general vision, ocular pain, near activities, distance activities, social functioning, mental health, role difficulties, dependency, driving, color vision, and peripheral vision. Based on questionnaire guidelines, the composite and each subscale scores ranged from 0 to 100, in which 0 represented the worst and 100 represented the best function. Estimates of internal consistency and test-retest reproducibility indicated reliability in the questionnaire content. Nonetheless, other tested scales and clinical variables supported the constructed validity of the questionnaire.¹⁸ Furthermore, this questionnaire has undergone psychometrics evaluation in the Persian language by Asgari *et al.* to confirm the validity and reliability of its content. For convergent validity, Pearson correlation coefficient more than 0.4 was observed between items and their original subscales. Cronbach's alpha was above 0.7 for all of the subscales except for that of "driving," which had a value of 0.68. The intraclass correlation coefficient was above 0.7 in all subscales.¹³ In our study, test-retest was used to determine the reliability of the questionnaire, hence it was completed by 20 recipients of corneal transplants whom did not enroll in the study, and 2 weeks later, the questionnaire was completed again by these people. The test-retest reliability was 88%, and the demographic data were analyzed by descriptive

statistics (mean, standard deviation, and confidence intervals). In addition, the VFQ-39 questionnaire was analyzed according to the VFQ-39 guidelines; thus, calculating mean and standard deviation was used to determine the composite score and the subscales of VR-QoL. Moreover, *t*-test was used to investigate the relationship between VR-QoL with gender, marital status, occupation, income, residential property status, and corneal transplant in one or both eyes. Finally, Pearson correlation coefficient was used to determine the relation between VR-QoL score with age and number of years after transplant as well as satisfaction. Level of $P < 0.05$ was considered statistically significant.

RESULTS

A total of 100 patients including 57 (57%) men and 43 (43%) women were enrolled in this study. The mean age of corneal transplant recipients was 34.96 ± 12.35 (range, 20–75) years with 61 (61%) married patients. Primary school was the highest educational level in 56 (56%) patients. Fifty-eight (58%) were employed, and 75 (75%) had insufficient income. A total of 84 (84%) patients were tenants that mostly lived in houses with an area of 60–79 m². Forty (40%) patients had families with two members. Ninety (90%) had unilateral cornea transplant. A great number of patients (49%) received corneal transplant 2 years before this study (range, 1–8 years), and 55 (55%) had transplantation due to the presence of keratoconus [Table 1].

The composite score of VR-QoL in corneal transplant recipients was 54.39 ± 9.22 (range, 32.9–71.01). The highest mean score among the subscales was related to the color vision 74.75 ± 27.63 (range, 0–100), and the lowest score was related to the dependency 31.06 ± 31.02 (range, 0–100) [Table 2].

The results showed a reverse correlation between age and VR-QoL ($r = -0.364$; $P < 0.001$; Pearson correlation coefficient = -0.364). In addition, there was a reverse correlation between VR-QoL with the numbers of posttransplantation years after the transplantation ($r = -0.362$; $P < 0.001$), but there was a correlation between satisfaction and VR-QoL ($r = 0.679$; $P < 0.001$) [Table 3].

Furthermore, the results indicated a significant difference in VR-QoL between men (mean: 56.35 ± 9.95) and women (mean: 52.46 ± 7.42) ($P < 0.001$, *t*-test) and also a significant difference in VR-QoL found between unilateral (mean: 55.79 ± 8.93) and bilateral (mean: 44.66 ± 0.92) graft ($P < 0.001$, *t*-test), but the association between other variables were not statistically significant.

DISCUSSION

In this study, VR-QoL score of corneal transplant patients was 54.93 ± 29.9 that is close to the results of a previous study on the VR-QoL of Iranian patients with chronic eye disease (cataract, glaucoma, and age-related eye degeneration) (54.5) and healthy people 96 (88.2–103.9).¹⁷ Furthermore, in the aforementioned study, the composite

Table 1: Demographic characteristics of the study participants (n=100)

Characteristic	Quantity in percentage
Age	34.96±12.35 (20-75)
Male/female	57 (57)/43 (43)
Married status	
Single	31 (31)
Married	61 (61)
Divorced	4 (4)
Deceased spouse	4 (4)
Educational status	
Diploma >	65 (65)
Diploma <	35 (35)
Employment status	
Employed	58 (58)
Retired	10 (10)
Unemployed	9 (9)
Homemaker	23 (23)
Income	
Adequate	4 (4)
Semi-adequate	21 (21)
Inadequate	75 (75)
Home area	64±5 (25-90)
Number of family members	
1	4 (4)
2	40 (40)
3	32 (32)
4	24 (24)
Home status	
Homeowner	16 (16)
Leased	84 (84)
Unilateral/bilateral corneal grafts	90 (90)/10 (10)
Cause of corneal transplantation	
Keratoconus	55 (55)
Trauma	45 (45)
Transplantation time (years)	
≤2	49 (49)
3-4	27 (27)
5-6	12 (12)
7-8	12 (12)
Visual acuity	
≥20/400	89 (89)
<20/400	11 (11)

score of patients with cataract was 64.6 (57.3–71.8), glaucoma 63 (50.5–75.4), age-related eye degeneration 53.1 (39.5–66.6), diabetic retinopathy 50.5 (38.7–62.3), and with poor eyesight 41.9 (30.7–53.1), whereas VR-QoL score of Iranian healthy people was 96 (88.2–100).¹⁷ In contrast, the composite score of patients in our study was lower than those with glaucoma and cataract. This difference could be due to the importance of corneal transplants from the recipients' perspective, subsequent outcomes, as well as various and long-term complications endured following the procedure.

Nonetheless, the patients VR-QoL score in this study was at the lower level compared to similar studies conducted

Table 2: Subscales score and composite score

	<i>n</i>	Minimum	Maximum	Mean±SD
General health	100	25.00	100.00	66.90±18.41
General vision	100	20.00	85.00	54.90±17.18
Ocular pain	100	37.50	62.50	50.75±8.48
Near activities	100	0.00	100.00	59.62±27.68
Distance activities	100	0.00	95.83	60.45±26.42
Social functioning	100	0.00	100.00	68.58±27.62
Mental health	100	5.00	80.00	36.90±20.34
Role difficulties	100	0.00	100.00	45.93±27.06
Dependency	100	0.00	100.00	31.06±31.02
Driving	46	0.00	100.00	48.18±41.64
Color vision	100	0.00	100.00	74.75±27.63
Peripheral vision	100	0.00	100.00	67.25±26.75
Composite score	100	32.92	71.01	54.39±9.22

SD: Standard deviation

Table 3: Patient satisfaction level

Questions	Answers	
	Yes (%)	CI _{0.95} (P)
(1) Are you happy with your graft outcome?	69 (69)	0.60-0.78
(2) Does the outcome match your expectation?	65 (65)	0.56-0.74
(3) Would you make the same decision again?	65 (65)	0.56-0.74
(4) Was having the graft worthwhile?	77 (77)	0.69-0.86
(5) Have you had more complications than you expected?	45 (45)	0.35-0.55

in other countries. For instance, VR-QoL score of patients with keratoconus who underwent the cornea transplant in the USA was 84.5 ± 12.1 .¹⁹ In other study in the USA, the score of patients with Fuchs' endothelial dystrophy who underwent corneal transplantation were as follows: 6 months after transplantation 78 ± 10 , 1 year after transplantation 83 ± 11 , 2 years after transplantation 83 ± 13 , and 3 years after transplantation 88 ± 8 .²⁰ Whereas in the Netherlands, the score of recipients was 78.9 .²¹ The difference between our results with these studies can be due to differences in the mean age of patients and posttreatment method, following corneal transplantation, culture, regulations, facilities, and other existing conditions within the societies.

In the present study, there was reverse correlation between age and VR-QoL ($P < 0.001$), whereas Puri *et al.* found a significant association between age and VR-QoL²² and did not find any significant association.²³⁻²⁵ Decreased physical and mental performance induced by higher age can be contributing factors influencing the VR-QoL parameter.

Furthermore, in our study, there was reverse correlation between VR-QoL with numbers of years after transplantation ($P < 0.001$), whereas this factor was corresponded with other studies.^{20,26} Nonetheless, aging can eventually decline treated vision, and thereby hamper the QoL. Similarly, the reduction of follow-up by patient to complete the treatment or improper post follow-up can also diminish VR-QoL as well as QoL. Nevertheless,

the lowest score in this study was related to the dependency subscale (31.06 ± 31.02) which could be resulted from the failure of providing regular and periodic care for the patients in the long-term.

The results of this study showed a significant difference in VR-QoL between both genders ($P < 0.001$). However, other studies demonstrated no association between genders with VR-QoL.^{12,26,27} It seems that the higher VR-QoL of men compared to women in this study was due to the fact that men are employed more than women, and corneal transplant improved their job performance, which, in turn, led to higher VR-QoL among men.

In addition, the results of this study indicated a significant difference in VR-QoL between unilateral and bilateral transplant recipients ($P < 0.001$); however, a study by Niziol *et al.* showed no significant difference between VR-QoL of unilateral and bilateral graft recipients.¹⁹ In contrast, the results of another study showed that patients who have received bilateral graft had lower psychosocial abilities than patients with unilateral graft.²³ It seems that the patients with unilateral graft enjoy better vision and fewer complications in the other eye, which affects their daily performance as well as VR-QoL.

Likewise, our results showed a correlation between satisfaction and VR-QoL ($P < 0.001$) which correspond to a study in Italy that implied most patients were satisfied with their corneal transplant.¹² It seems that patient satisfaction was related to improved eyesight, reduced complications, and the overall impact of these factors on daily lives of transplant recipients.

The limitation of this study was convenience and non-random sampling. Although patients admitted to hospitals were from different geographical areas, due to non-random sampling, and the results cannot be attributed to the entire corneal transplant recipients. However, an initial estimation showed the importance and the need for assessing the status of these patients in the country.

In the present study, the VR-QoL score of corneal transplant recipients was at a lower level compared to healthy people, and also to recipients in other countries. However, this score was nearly equal to those patients with chronic eye diseases (e.g., cataract, glaucoma, age-related eye degeneration, diabetic retinopathy, and low vision) in Iran. It also demonstrates that corneal transplant had the highest impact on color vision and the lowest on dependency of the individuals. Moreover, the results of this study provide a comprehensive picture for the state of vision and the overall health status of patients for health-care providers to enhance the patient care.

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Conflicts of interest

There are no conflicts of interest.

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