• Clinical Research •

Visual and health-related quality of life in cataract patients versus healthy controls

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Abstract

● **AIM:** To compare health-related quality of life and vision-related quality of life between patients with cataracts and healthy controls.

● **METHODS:** This research was carried out as a cross-sectional study. Participants were selected from Rasoul Akram Hospital in Tehran, Iran, comprised of two groups: healthy individuals and those diagnosed with cataracts, using a simple random sampling technique. Following the interviews, participants completed the SF-36 health-related quality of life questionnaire and the VFQ-25 vision-related quality of life questionnaire. Comprehensive optometric and ophthalmic assessments, were conducted for all participants.

● **RESULTS:** This research involved a selection of 130 healthy individuals and 154 cataract patients who were candidates for cataract surgery. The average ages of the healthy individuals and cataract patients were 69.7±3.5 and 69.5±6.5y, respectively (P=0.837), with 42.3% of the healthy individuals and 44.8% of the cataract male patients (P=0.672). According to the SF-36 questionnaire, the quality of life regarding physical functioning, role limitations due to physical health, social functioning, pain, and general health were significantly worse among cataract patients. The composite physical index for cataract patients and healthy individuals was 70.7±9.08 and 78.53±8.17, respectively (P<0.001; effect size=0.90, 95%CI: 0.66-1.15), while the mental index showed no significant difference between the two groups (P=0.112; effect size=0.19, 95%CI: -0.04-0.42). All aspects of the VFQ-25 questionnaire were notably lower in cataract patients, with the mean final VFQ-25 scores being 56.49±14.81 for cataract patients and 92.9±4.64 for healthy individuals (P<0.001; effect size=3.21, 95%CI: 2.85-3.56). The VFQ-25 questionnaire indicated that the most significant effect size was associated with role difficulties and distance activities. More components from both questionnaires exhibited a substantial correlation with best-corrected visual acuity in cataract patients.

● **CONCLUSION:** Patients suffering from cataracts exhibit a significantly reduced health-related quality of life, especially concerning physical health and vision-related quality of life, compared to those without cataracts. Timely surgical treatment for these individuals can improve their overall quality of life.

● **KEYWORDS:** quality of life; cataract; elderly

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INTRODUCTION

Forecasts suggest that by 2050, approximately 474 million people worldwide will have visual impairment, with 61 million classified as blind[1]. Based on the presenting visual acuity, research has shown that uncorrected refractive errors and cataracts are the first and second causes of global visual impairment, with cataracts being the predominant cause of blindness[1]. Cataracts are responsible for 45.4% of blindness and 38.9% of visual impairment internationally[1-2]. Cataracts are a common ocular condition, especially in those aged 50y and above, outpacing the prevalence of numerous other health issues. Studies show that around two-thirds of people over 60y have experienced cataracts[3-7].

Additionally, recent studies reveal a global shift toward increasingly aging populations, indicating that cataracts will likely become a more critical problem in eye care in the coming years. A recent study reveals that from 1990 to 2021, the worldwide years lived with disability (YLDs) due to cataracts increased by more than 90%[8]. In addition to the burdens cataracts impose on national healthcare systems, they profoundly impact individuals' quality of life and mental

health[9-10]. The visual impairment caused by cataracts can cause personal impacts, including various accidents, and may also lead to psychological problems such as depression, cognitive impairments, and feelings of loneliness[11-13]. These negative consequences can further affect an individual's social relationships and lead to occupational and economic challenges.

Previous studies on visual function have indicated that health-related quality of life and psychological well-being are related to visual performance in everyday life[14-17]. Investigations have also examined both health-related and vision-related quality of life among patients with cataracts[14,16]. Furthermore, evidence indicates that cataract surgery improves the quality of life, even in individuals with milder cataracts. Given the significance of cataracts, their high prevalence, and the aging population worldwide, it is anticipated that there will be an increased focus on the quality of life for these patients[18-23]. Many individuals with cataracts also suffer from other age-associated conditions due to their age. Consequently, understanding their overall quality of life, vision-related quality of life, and vision-related function may contribute to enhancing the quality of life in older ages. According to Hashemi *et al*[4], the prevalence of cataract among individuals aged 60y and older exceeds 70%. Given that the population of this age group in Iran is estimated at approximately 10 million, it is likely that more than 7 million elderly individuals are affected by cataracts. This highlights the need for focused attention on this population with regard to their quality of life. Given the aging population in Iran and the high prevalence of cataracts among the elderly, there is a scarcity of studies that comprehensively examine both overall quality of life and vision-related quality of life in this group, this study aims to assess the vision-related and health-related quality of life in cataract patients and compare these metrics with those without cataracts.

PARTICIPANTS AND METHODS

Ethical Approval The Ethics Committee of Iran University of Medical Sciences approved the study protocol. Tenets of the Helsinki Declaration were observed in this study, and written informed consent was obtained from all participants (ethical code: IR.IUMS.FMD.REC.1402.231).

The current research was designed as a cross-sectional descriptive-analytical investigation. In this research, two distinct groups of participants were randomly chosen. Both sample groups were sourced from Rasoul Akram Hospital (Tehran, Iran), with the control group comprising individuals who visited the hospital for routine check-ups and fulfilled the inclusion criteria for the study. The first group consisted of patients diagnosed with cataracts, specifically those classified as candidates for cataract surgery. These patients were included in the study if they exhibited grade 3 or higher cataracts, as determined by a slit-lamp examination conducted by an ophthalmologist per the World Health Organization's grading system. The comparison group was composed of normal individuals who exhibited lens opacities less than grade 2 and had no pathological issues related to the retina.

In light of the potential confounding effects of age and sex on quality of life, these variables were accounted for in both participant groups. After selecting the patients and the control group and obtaining their informed consent, the participants engaged in interviews, filled out a questionnaire, and underwent comprehensive optometric and ophthalmological evaluations. Initially, demographic information, such as age, sex, and educational attainment, was gathered through interviews.

Following this, assessments of health-related quality of life and vision-related quality of life were conducted using validated questionnaires. The optometric evaluations included measurements of uncorrected distance visual acuity, non-cycloplegic refraction, and subjective refraction. Subsequently, ophthalmological assessments were performed, encompassing slit-lamp examinations, evaluations of the cornea, eyelids, and iris, and assessments for lens opacity on dilated pupils by World Health Organization guidelines.

Finally, retinal examinations were carried out on the participants using a +90-diopter lens.

Participants with a history of cataract surgery, as well as those with systemic diseases such as a history of myocardial infarction or cerebrovascular accident, were excluded from the study.

25-item National Eye Institute Visual Function Questionnaire The 25-item National Eye Institute Visual Function Questionnaire (NEI VFQ-25) has demonstrated validity and reliability in Persian, as established by Asgari *et al*[24]. It comprises 25 items and questions that evaluate vision-related quality of life[25]. The original numerical data derived from the study are standardized and recoded to a scale of 100, where the highest score reflects optimal performance. The VFQ-25 score ranges from a minimum of 0, indicating the worst outcome, to a maximum of 100, representing the best outcome. This questionnaire includes various subcategories that assess general health, general vision, ocular pain, near activities, distance activities, social functioning, mental health, role difficulties, dependency, driving, color vision, and peripheral vision. Each subcategory is scored from 0 to 100, with zero denoting the lowest performance and 100 the highest. The total score for each questionnaire is calculated by averaging the scores of the items, excluding the general health question, resulting in the VFQ-25 composite score, which serves as the final score for the VFQ-25 questionnaire. This averaging approach ensures that equal weight is assigned

Table 1 The mean and standard deviation of scores of the SF-36 questionnaire components for normal and cataract groups

SF-36 questionnaire components	Normal	Cataract	Effect sizes (95%CI)	*P*
Physical functioning	75.35±13.33	55.1±14.41	1.45 (1.19, 1.72)	0.001
Role limitations due to physical health	92.5±14.15	84.42±24.43	0.4 (0.16, 0.63)	0.001
Role limitations due to emotional problems	92.05±18.47	87.45±23.21	0.22 (-0.02, 0.45)	0.064
Energy/fatigue	52.04±18.32	54.64±18.72	-0.14 (-0.37, 0.09)	0.239
Emotional well-being	64.46±12.06	66.16±13.74	-0.13 (-0.36, 0.1)	0.275
Social functioning	90.87±12.03	81.33±14.66	0.71 (0.46, 0.95)	0.001
Pain	90.58±11.74	94.55±7.45	-0.41 (-0.65, -0.18)	0.001
General health	55.69±12.69	48.73±11.88	0.57 (0.33, 0.81)	0.001
Physical	78.53±8.17	70.7±9.08	0.9 (0.66, 1.15)	0.001
Mental	74.85±11.58	72.39±14.01	0.19 (-0.04, 0.42)	0.112

CI: Confidence interval.

to each subcategory; if the total score were derived by directly averaging the items, subdomains with more items would disproportionately influence the overall score. Thus, this method maintains uniformity in the weighting of all subdomains.

Short Form Health Survey The Short Form Health Survey (SF-36) comprises 36 items assessing overall health-related quality of life. Developed in the United States in 1992 by Ware and Sherbourne[26], this questionnaire has undergone validation and reliability testing across diverse patient populations. The Persian version of the SF-36 has demonstrated both validity and reliability, as evidenced by research conducted by Montazeri *et al*[27]. The questionnaire evaluates eight dimensions pertinent to quality of life, including physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health. Ultimately, two overarching subscales physical health and mental health—are derived from the aggregation of specific components. The physical health subscale is computed as the average of the subscales for physical functioning, role limitations due to physical health, pain, and general health, while the mental health subscale is derived from the average of the subscales for role limitations due to emotional health, energy/fatigue, emotional well-being, and social functioning. Additionally, the questionnaire is recoded to a scale ranging from 0 to 100 to facilitate accurate comparisons among the various items.

Statistical Analysis Statistical analysis was conducted using IBM SPSS Statistics version 27. Initially, the average and standard deviation of the subcategories from the SF-36 and NEI VFQ-25 questionnaires were calculated for both groups. Additionally, the overall score was included alongside the subcategory results. Subsequently, an independent *t*-test was conducted to assess the differences in these parameters between the two groups. The correlation between best-corrected visual acuity in the better eye and the questionnaire components was evaluated using the Pearson correlation coefficient.

RESULTS

This study comprised 130 healthy participants and 154 cataract patients who qualified for surgical intervention. The mean age of the healthy participants was 69.7±3.5y, compared to 69.5±6.5y for the cataract patients (P=0.837). Furthermore, 42.3% of the healthy participants and 44.8% of the cataract patients were male (P=0.672).

The mean years of education among normal subjects was 9.21±5.3, compared to 8.3±4.2 in the cataract group (P=0.129). Among normal individuals, 22.3%, 28.5%, and 49.2% were classified as having low, medium, and high economic status, respectively. In contrast, the corresponding results for cataract patients were 30.5%, 31.2%, and 38.3% (P=0.143). The mean uncorrected visual acuity was 0.97±0.06 decimals in normal participants and 0.34±0.24 in cataract patients (P<0.001), based on a spherical equivalent of 0.5 diopters or worse, the prevalence of myopia and hyperopia in the normal group was 5.4% and 49.6%, respectively, while in the cataract group it was 49.4% and 36.4%. Notably, hyperopia was more prevalent among normal subjects, whereas myopia was significantly more prevalent in those with cataracts (P<0.001).

Table 1 presented the average scores of the SF-36 questionnaire components, as well as the overall averages for the physical and mental composite scores for both the normal and cataract groups. The data indicate that cataract patients experienced a significantly lower quality of life in terms of physical functioning and role limitations due to physical health, social functioning, pain, and general health. Moreover, the physical composite index showed a superior average in the normal group, whereas the mental composite index revealed no significant differences between the two groups.

The elements of the VFQ-25 questionnaire were analyzed and compared between the normal and cataract groups, as presented in Table 2. The results indicated that all components

Table 2 The mean and standard deviation of the elements of the VFQ-25 questionnaire for normal and cataract groups

Elements of the VFQ-25 questionnaire	Normal	Cataract	Effect sizes (95%CI)	*P*
General health	54.23±23.32	41.56±25.28	0.52 (0.28, 0.76)	0.001
General vision	70.46±13.69	38.31±17.85	2.00 (1.71, 2.28)	0.001
Ocular pain	92.31±8.44	85.06±15.53	0.57 (0.33, 0.80)	0.001
Near activities	91.09±9.85	50.49±20.04	2.51 (2.19, 2.82)	0.001
Distance activities	93.27±10.07	45.29±15.57	3.60 (3.22, 3.97)	0.001
Social functioning	100±0.00	78.81±13.88	2.07 (1.78, 2.36)	0.001
Mental health	93.41±8.39	55.07±22.06	2.23 (1.93, 2.52)	0.001
Role difficulties	93.85±10.47	50.24±12.90	3.68 (3.30, 4.06)	0.001
Dependency	98.78±2.96	45.67±30.00	2.39 (2.09, 2.70)	0.001
Driving	92.77±8.8	51.06±23.57	2.55 (2.09, 3.00)	0.001
Color vision	100±0.00	64.77±20.73	2.31 (2.00, 2.61)	0.001
Peripheral vision	95.96±9.24	52.44±18.91	2.85 (2.52, 3.18)	0.001
VFQ-25 composite	92.9±4.64	56.49±14.81	3.21 (2.85, 3.56)	0.001

CI: Confidence interval.

were significantly poorer in patients with cataracts. Notably, the most substantial effect size was observed with role difficulties and distance activities, while the least effect size pertained to general health. Table 3 illustrated the correlation between the best-corrected visual acuity in the better eye and the various components of the SF-36 and VFQ-25 questionnaires among patients with cataracts and healthy individuals.

The distribution of the physical composite index of SF-36 questionnaire and VFQ-25 composite between the normal and cataract groups is shown in Figure 1.

It is evident that more components exhibited a significant correlation with best-corrected visual acuity in patients with cataracts. Specifically, factors such as physical functioning, ocular pain, distance activities, mental health, role difficulties, driving, and peripheral vision, and the VFQ-25 composite demonstrated a statistically significant direct correlation with best-corrected visual acuity in both cataract patients and healthy individuals. However, the strength of these correlations tends to be greater among cataract patients compared to their healthy counterparts.

Our findings revealed that in healthy individuals, the correlation between the physical and mental components of the SF-36 questionnaire and the total score of the VFQ-25 was 0.113 and -0.037, with *P*-values of 0.200 and 0.676, respectively. Conversely, these correlations were significantly higher in patients with cataracts at 0.421 and 0.250, with *P*-values of <0.001 and 0.002, respectively.

Among cataract patients, the mean VFQ-25 composite scores for those with nuclear, cortical, and posterior subcapsular cataracts (PSC) were 56.8±15.18, 56.61±12.01, and 49.38±12.4, respectively (*P*<0.001). The mean physical component scores of the SF-36 questionnaire in these groups were 70.66±9.41 for nuclear, 69.33±6.88 for cortical, and

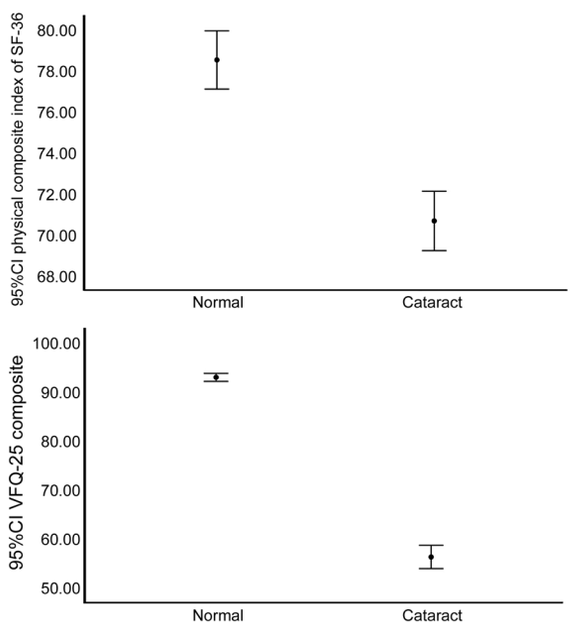

Figure 1 The distribution of the physical composite index of SF-36 questionnaire and VFQ-25 composite between the normal and cataract groups CI: Confidence interval.

75±5 for PSC cataracts (*P*<0.001). For the mental component, the corresponding scores were 72.39±14.35, 73.33±13.87, and 70.05±4.1, respectively, with no statistically significant difference observed (*P*=0.112).

In Table 4, the relationship between the VFQ-25 Composite and the Physical and Mental components of the SF-36 questionnaire with the two normal and cataract groups in a multiple linear regression model with the presence of age, gender, and education has been evaluated.

DISCUSSION

The present study investigated the quality of life among cataract patients utilizing the SF-36 questionnaire, alongside an assessment of vision-related quality of life through the

Table 3 The correlation between the best-corrected visual acuity in the better eye and the various components of the SF-36 and VFQ-25 questionnaires for normal and cataract groups

Parameters	Normal		Cataract	
	Correlation	*P*	Correlation	*P*
SF-36 questionnaires				
Physical functioning	0.312	<0.001	0.544	<0.001
Role limitations due to physical health	0.010	0.907	0.093	0.253
Role limitations due to emotional problems	0.065	0.461	0.214	0.008
Energy/fatigue	-0.071	0.422	0.026	0.750
Emotional well-being	0.013	0.882	0.129	0.112
Social functioning	-0.052	0.555	0.235	0.003
Pain	0.038	0.670	0.039	0.635
General health	-0.067	0.447	0.089	0.271
Physical	0.119	0.177	0.315	<0.001
Mental	-0.012	0.891	0.191	0.018
VFQ-25 questionnaires				
General health	0.136	0.122	0.021	0.795
General vision	0.077	0.383	0.193	0.017
Ocular pain	0.360	<0.001	0.236	0.003
Near activities	0.056	0.529	0.626	<0.001
Distance activities	0.480	<0.001	0.558	<0.001
Social functioning	-	-	0.592	<0.001
Mental health	0.574	<0.001	0.624	<0.001
Role difficulties	0.409	<0.001	0.324	<0.001
Dependency	-0.017	0.845	0.580	<0.001
Driving	0.232	0.035	0.453	0.001
Color vision	-	-	0.548	<0.001
Peripheral vision	0.293	0.001	0.488	<0.001
VFQ-25 composite	0.459	<0.001	0.626	<0.001

Table 4 The association between VFQ-25 composite and physical and mental component of SF-36 with studied group and education, age and sex in multiple linear regression

Parameters	VFQ-25 composite		Physical		Mental	
	Coefficient (95%CI)	*P*	Coefficient (95%CI)	*P*	Coefficient (95%CI)	*P*
Group (cataract/normal)	-36.38 (-39, -33.75)	<0.001	-8.11 (-10.11, -6.11)	<0.001	-3.17 (-6.02, -0.31)	0.030
Education (y)	0.07 (-0.2, 0.35)	0.606	-0.25 (-0.46, -0.04)	0.022	-0.7 (-1, -0.4)	<0.001
Age (y)	-0.42 (-0.67, -0.17)	0.001	-0.33 (-0.52, -0.14)	0.001	-0.7 (-0.97, -0.43)	<0.001
Sex (female/male)	1.05 (-1.62, 3.72)	0.438	-0.88 (-2.91, 1.15)	0.394	0.01 (-2.89, 2.91)	0.994

CI: Confidence interval.

VFQ-25 questionnaire, compared to healthy individuals. The results demonstrated that, based on the SF-36 questionnaire, all dimensions, except for role limitations due to emotional problems, energy/fatigue, and emotional well-being, were significantly poorer in cataract patients. Importantly, the physical aspect of quality of life was found to be reduced in cataract patients, while no significant differences were noted between the two groups concerning mental health. A review of the existing literature in this field indicates that most studies have yielded findings that align with those of the present research.

Despite variations in the tools employed to evaluate the overall quality of life across different studies, there is a consensus that cataracts adversely impact the quality of life. A pivotal study in this area was conducted by Assi *et al*[28], who demonstrated that ocular conditions, such as cataracts and macular degeneration, profoundly affect the quality of life across all age demographics. A significant portion of the decline in quality of life among cataract patients is attributable to impaired vision. This topic will be elaborated upon in the subsequent section. Furthermore, the significance of cataract disease in diminishing quality of life is underscored by numerous studies indicating improved quality of life following cataract surgery[10,14,16,21,29-30]. A survey conducted by Błachnio *et al*[31] revealed that the

health-related quality of life significantly improved after cataract surgery. The findings suggested that younger patients experienced a more substantial increase in their post-surgery quality of life compared to their older counterparts[31]. This phenomenon may be explained by the fact that cataracts are often the only health issue faced by younger individuals. At the same time, older patients typically deal with multiple age-related health problems in addition to their vision concerns. Moreover, the research conducted by Harutyunyan *et al*[14] and Hong *et al*[32] supported the conclusion that quality of life improves until two years following cataract surgery. Jansone-Langina *et al*'s[30] study indicated that the degree of improvement in quality of life after surgery is affected by the type of cataract, with the most significant enhancements noted in patients with cortical cataracts. Furthermore, the research by Taipale *et al*[33] demonstrated that cataract surgery also benefits the quality of life for individuals suffering from age-related macular degeneration.

Porela-Tiihonen *et al*[34] demonstrated that cataract patients experienced an improved quality of life one year after surgery. Nevertheless, even after the surgical intervention, their quality of life remained inferior to that of the normal population when adjusted for age and sex. The findings from this and previous studies affirm that cataracts significantly diminish quality of life. Notably, while the physical quality of life is adversely affected in cataract patients, their mental quality of life shows no significant difference compared to the control group.

It is clear that visual impairment results in a range of social and physical difficulties. Cataracts are identified as the primary cause of visual disability worldwide[2]. Previous studies have shown that individuals with visual impairments face challenges performing essential daily activities and even in simple communication. Many physical tasks require not only physical strength but also sufficient visual abilities. After the onset of cataracts, functions such as visual acuity, color discrimination, and contrast sensitivity are adversely affected[3].

Notably, we were surprised to find no significant difference in mental quality of life between the two groups, even though many studies have emphasized the effects of vision loss and cataracts on mental health, including anxiety, depression, and cognitive problems. Additionally, Yotsukura *et al*'s[23] research indicated that cataract surgery significantly improves patients' happiness and satisfaction after the operation. Research by Mylona *et al*[20] in Greece found that patients reported a better quality of life and a reduction in depressive symptoms following cataract surgery.

The overall quality of life is anticipated to be closely linked to vision-related quality of life. Notably, our research revealed that this significant correlation was predominantly observed in patients with cataracts, particularly highlighting the strongest association between vision-related quality of life and the physical dimension of the overall quality of life. This suggests that cataracts have a more pronounced impact on the physical activities of individuals than on their psychological well-being. Our findings indicated that all aspects of vision-related quality of life, measured by the VFQ-25 questionnaire, were considerably poorer in cataract patients. It was indeed expected that cataracts would substantially affect vision-related quality of life. However, there is a scarcity of studies focusing solely on the impact of cataracts on vision-related quality of life in comparison to patients without cataracts, which we have done. Most existing research examines this aspect of post-cataract surgery. Nonetheless, some studies have identified that visual acuity and demographic factors such as economic status, education, age, and sex significantly influence the vision-related quality of life in individuals with cataracts[35].

Research conducted by Havstam Johansson *et al*[36] in Gothenburg, Sweden, involving a cohort of 70-year-olds, revealed that individuals suffering from cataracts and macular degeneration exhibited diminished scores on the vision-related quality of life as assessed by the NEI VFQ-25 questionnaire. Additionally, findings from West Africa indicated that cataract surgery significantly enhances both visual acuity and the overall quality of life for patients[10]. Numerous studies have corroborated the beneficial effects of cataract surgery on vision-related quality of life. For instance, research by To *et al*[37] demonstrated that the average quality of life score before cataract surgery was 47.2, which significantly improved to 83.5 post-surgery, with younger patients typically experiencing more substantial gains.

Furthermore, McKean-Cowdin *et al*[38] established a correlation between visual acuity and NEI-VFQ-25 scores to support our conclusions. Other investigations have similarly indicated that enhancements in VFQ scores following surgery are linked to improvements in visual function. In Turkey, Akpolat *et al*[18] found that with the exception of the general health and driving subscales, all other aspects of vision-related quality of life showed significant increases after cataract surgery. Moreover, He *et al*[29] in China demonstrated the favorable impact of phacoemulsification surgery on visual function and the quality of life among elderly patients with cataracts. While the quality of life has been evaluated through questionnaires for many years, a recent trend has emerged focusing on more realistic assessment methods, such as the Real-Life Vision Test (RLVT), which offers a more accurate evaluation of the effects of cataract surgery in conjunction with traditional clinical and questionnaire approaches[39]. Our research stands out as one of the few that has compared health-related quality of life and vision-related quality of life between cataract patients and healthy individuals. The results of this study hold potential

implications for clinical practice and the overall health of the elderly population. However, utilizing more specialized questionnaires would yield better insights for a thorough investigation of psychological factors.

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