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## Health-related quality of life among adult patients with visual impairments in Yazd, Iran

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### Abstract

#### BACKGROUND:

Visual impairment (VI) is one of the major public health problems that cause suffering, disability, loss of productivity, and reduced quality of life (QoL). This study aimed to evaluate the health-related QoL (HRQoL) among adults with visual problems in 2021.

#### MATERIALS AND METHODS:

This analytical cross-sectional study was conducted on 300 patients with VIs referring to ophthalmology centers in Yazd, Iran. Data were collected through face-to-face interviews using EQ-5D, visual analog scale (VAS), and demographic information questionnaires. The results were analyzed using independent sample *t*-test, one-way analysis of variance, Pearson correlation coefficient, and adjusted limited dependent variable mixture model (ALDVMM) model by STATA, and SPSS.

#### RESULTS:

The mean and standard deviation of EQ-5D-5 L index and EQ-VAS score in the studied patients were  $0.68 \pm 0.25$  and  $72.46 \pm 19.36$ , respectively. Most problems at unable/extreme level were related to the mobility dimension (12%) and the usual activities dimension (9%). Factors related to HRQoL scores using ALDVMM model showed that divorced or widow marital status, age over 50, having strabismus, and acuter visual problems had significant negative effects on EQ-5D-5 L index values ( $P < 0.05$ ).

#### CONCLUSIONS:

The results showed that HRQoL was moderate in patients with VIs and reduced in patients with high disease severity, old age, lack of a spouse, retirement, and nonuniversity education. As a result, socioeconomic and demographic characteristics were required to be considered in visual health policies.

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**Keywords:** EQ-5D, quality of life, vision disorders

## Introduction

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About 1.3 billion people of all age groups in the world live with some form of visual impairment (VI), of whom 36 million are blind ( $< 0.05$  decimal; 20/400 Snellen; 1.3 logMAR) and 217 million have moderate to severe VI (between  $<0.3$  and  $\geq 0.05$  decimal; 20/400 Snellen; 1.3 logMAR).[1] While it is estimated that more than 80% of visual problems can be treated,[2] about 90% of people with VI live in developing countries who may not have access to appropriate treatment.[3]

Vision plays a vital role in the proper functioning of any person in life because about 80% of the function of the five senses is dependent on vision[4] and vision loss is associated with reduced performance and challenges of daily activities.[5] Research has shown that vision loss affects a person's independence and mobility[6] and his/her ability to perform day-to-day activities.[7] Depression,[8] social loneliness,[9] frustration and anxiety,[10] and low socialization and emotional distress[11,12] are other problems reported in patients with VI. VI and blindness are among the most important public health problems that cause significant suffering, disability, loss of productivity, and reduced quality of life (QoL) for millions of people.[13]

The World Health Organization defines QoL as an individual's perception of his or her position in life in terms of the culture and value systems in which he/she lives and according to their goals, expectations, standards, and priorities.[14,15] As a result, QoL is an abstract concept that exists only in the mind of the person whose life is affected, and it cannot be directly observed.[14] The importance of QoL and maintaining independence is such that the experts considered improved QoL and health status as the center of gravity of health care in the present century, so that today the health-related QoL (HRQoL) is more important than ever. HRQoL focuses on the aspects of QoL including life satisfaction that is affected by health.[16,17] Thus, the term distinguishes the effects of disease and treatment from health care and sees life beyond disease and health.[18]

HRQoL has been one of the most important topics in clinical research over the past two decades, and it has been studied to identify differences between groups of patients and clients and predict the consequences and evaluate therapeutic interventions.[19] Therefore, QoL evaluation is clinically important in people with VI.[20] Even if it is not possible to improve visual function in these patients, such assessments may provide important information in determining the disability associated with VI and help develop targeted interventions to improve the QoL of these patients.[21]

In this study, a generic preference-based measure (EQ-5D-5 L) was used to measure the QoL of visually impaired patients. Generic preference-based measures assess a wide range of different aspects of health in a variety of diseases. These tools make it possible to compare health scores in patients with different diseases with each other or with the general population.[22] Generic preference-based measures consist of a descriptive system and a set of utilities that assign a specific weight or utility to each state of health.[23] Generic preference-based measures have an advantage for calculating QALY in economic evaluation studies because they take into account the preferences of individuals in the community. The pres

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study aims to evaluate HRQoL among adults with VIs.

## Methods

### Study design and participants

This was a analytical cross-sectional study conducted on patients referred to public and private eye clinics in Yazd province (central Iran) in 2021. The sample size was calculated using the following formula:

$$n = \frac{z^2 \sigma^2}{d^2}$$

where  $z = 1.96$  (95% level of significance),  $\sigma$  = variance of HRQoL based on previous study,[24] and  $d$  = precision, set at 0.019. The final calculated sample size was 300 patients. Inclusion criteria included medical diagnosis of patients with visual problems (cataracts, glaucoma, age-related macular degeneration [ARMD], diabetic retinopathy, and VI for any reason), age over 18, ability to communicate, and not having chronic diseases such as uncontrolled high blood pressure, cancer, diabetes leads to heart, physical and kidney problems, advanced cardiovascular disease, and inability to perform daily activities due to physical problems other than vision. Patients who were unwilling to cooperate were excluded from the study. The nonrandom and purposeful sampling is used, so that in consultation with an ophthalmologist, an attempt is made to study patients with different severities.

### Instrument

**Health-related quality of life** The EQ-5D-5 L questionnaire developed by EuroQol Group was used to assess the HRQoL.[25] The tool describes health states based on five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The visual analog scale (VAS) is placed at the end of this questionnaire. The VAS part of the EQ-5D questionnaire is a 20-cm ruler that people can express their health status by choosing one of the numbers on the ruler. In this grading marked on the ruler, the best state of health is marked with the number 100 and the worst state of health with zero. These two states are marked on both sides of the grading spectrum. In this part of the EQ-5D questionnaire, people are asked to specify a score on the scale (0–100) that indicates their health status and write the desired score inside a box embedded for this purpose.[26] One of the major advantages of the EQ-5D over other general HRQoL measuring instruments is that it is short and takes less time to complete. Each of the five dimensions of this questionnaire is questioned using five-level options.[27,28] The five levels are no problems (1), slight (2), moderate (3), severe (4), and unable/extreme (5).

Regarding the valuation of health states, considering the availability of the values of the EQ-5D-3 L questionnaire, for valuation of the health states in this study for the EQ-5D-5 L tool, the crosswalk method recommended by the EuroQoL group,[29] are used. This technique creates health states values for the EQ-5D-5 L by linking the EQ-5D-5 L and EQ-5D-3 L descriptive systems. In this study, the Persian version of the EQ-5D-5 L tool is used. In order to determine the HRQoL in patients, the score obtained from five dimensions of the EQ-

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L for each person was considered as a mean EQ-5D-5 L index, which was a number between 0 and 1. The score from VAS, which was between 0 and 100, was entered as the mean EQ-VAS index in the calculations. The validity and reliability of the Persian translation of EQ-5D-5 L have been confirmed by the EuroQoL group.[30] Also in the study conducted in Iran, this questionnaire has been validated and reliable ( $\alpha = 0.765$ ).[31]

## Data collection

After selecting the patients based on the inclusion criteria, the visual acuity of binocular and monocular was determined by an optometrist through Snellen chart. Then, for face-to-face interviews and completing the questions, the patient was invited to a private room and EQ-5D, VAS and demographic information questionnaires were completed. In order to group the patients according to the best modified visual acuity of the binoculars, at first the best visual acuity of the patients obtained from Snellen chart was selected and converted to LogMAR scores. The obtained score was grouped into four groups: mild VI ( $0.3 \geq \log\text{MAR} < 0.48$ ), moderate VI ( $0.48 \geq \log\text{MAR} < 0.1$ ), severe VI ( $1 \geq \log\text{MAR} < 1.3$ ) and blindness ( $\log\text{MAR} \geq 1.3$ ).[32]

## Statistical analysis

The study information was described through frequency, percentage, mean and standard deviation statistics, and bar graphs. In this study, CROSSWALK method for EQ-5D-5 L was used in Iran to calculate the EQ-5D scores,[33] so that the TTO score in proportion to five dimensions for each patient is considered as EQ-5D score. Due to the normality of data distribution based on Kolmogorov-Smirnov test ( $P < 0.05$ ), independent sample *t*-test and One-way analysis of variance were used to compare the mean EQ-5D-5 L and EQ-VAS score in terms of demographic variables.

Given that the distribution of EQ-5D data is usually skewed and multimodal, and often has a large number of observations at the top (ceiling effects), the use of basic models such as ordinary least squares and Tobit is inappropriate for analysis of such data.[34] Therefore, adjusted limited dependent variable mixture model (ALDVMM) is used to investigate the effect of different variables on HRQoL. This model has been specially developed in dealing with EQ-5D tool distribution features.[35] Data were analyzed using StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC.). Significance level was considered 0.05 in all tests.

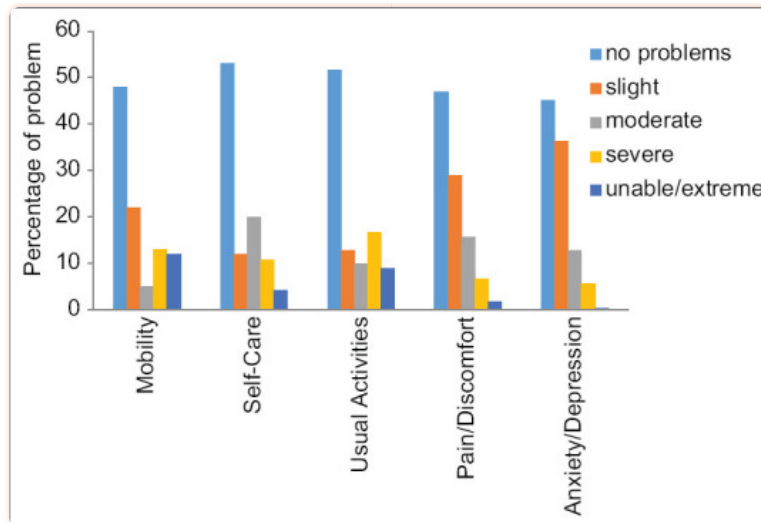
## Results

A total of 300 patients with VI were studied. The mean age of the patients was  $49.78 \pm 17.85$  years, the majority of whom are under the age of 40 years (117 [39%]) and over 60 years (92 [30.7%]). Also, the majority of patients were female 151 (50.3%), married 194 (64.7%), unemployed 112 (37.2%) and had university education 125 (41.7%). Regarding the type of eye disease, 41 (13.7%) had cataracts, 78 (26%) ARMD, 63 (21%) glaucoma, 17 (5.7%) diabetic retinopathy, 55 (18.3%) strabismus and the rest have other visual problems. In terms of severity of visual problems, 170 (56.6%) was mild, 33 (11%) moderate, 32 (10.7%) severe and 65 (21.7%) blind.

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## Percentage of problem levels of each EQ-5D-5 L dimensions

The percentage distribution of HRQoL problems in terms of levels and dimensions is shown in [Figure 1](#). The percentage of healthy state reports in five dimensions of mobility, self-care, usual activities, pain and discomfort and depression are 48%, 53%, 51.7%, 47% and 45%, respectively. At unable or extreme level, the most and the least problems are related to the mobility dimension (12%) and pain and discomfort (1.7%), respectively. At severe level, the most problems are related to the Usual Activities (16.7%) and mobility dimension (13%), respectively [[Figure 1](#)].



[Figure 1](#)

Percentage of problem levels of each EQ-5D-5 L dimensions reported by the patients

## EQ-5D-5 L index values and EuroQoL Visual Analogue Scale scores

The mean and standard deviation of EQ-5D-5 L index and EQ-VAS score in the studied patients are  $0.68 \pm 0.25$  and  $72.46 \pm 19.36$ , respectively. The mean reported by [Table 1](#) variable in EQ-5D-5 L index and EQ-VAS score shows a similar situation in patients' health states. Based on Pearson test, a strong and significant correlation is observed between the two scores ( $r = 0.911$ ,  $P < 0.001$ ) [[Table 1](#)].

## Table 1

Demographic characteristics and EuroQoL-five-dimension-five levels index values and EuroQol-Visual Analogue Scale scores ( $n=300$ )

<sup>a</sup>Statistical significance of differences calculated using One-way ANOVA, <sup>b</sup>Statistical significance of differences calculated using Independent *t*-test. SD=Standard deviation, ARMD=Age-related macular degeneration, VI=Visual impairment

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## Univariate analyses

In [Table 1](#), the relationship between patients' demographic variables with EQ-5D-5 L and EQ-VAS score is investigated through univariate analysis. The mean scores are significant in terms of age groups so that with increasing age, the mean of EQ-5D-5 L index and EQ-VAS score decreases ( $P < 0.001$ ). Regarding marital status, a significant relationship is observed between the mean scores so that the QoL score based on EQ-5D-5 L index and EQ-VAS score in divorced or widow patients is lower than single and married ones ( $P < 0.05$ ). The mean of EQ-5D-5 L index and EQ-VAS score in patients according to employment and education status also shows that retired patients and patients with nonuniversity education have significantly lower QoL scores ( $P < 0.001$ ). Regarding the type of eye disease, a significant difference is observed between the mean scores in both indices so that the QoL of ARMD and glaucoma patients is lower than other patients ( $P < 0.001$ ). Regarding the severity of eye disease, patients' QoL scores are significantly reduced with increasing severity of visual problems ( $P < 0.001$ ) [[Table 1](#)].

## Regression analyses

Factors related to HRQoL scores using ALDVMM model shows that divorced or widow marital status, age over 50, having strabismus and higher severity of VIs have significant negative effects on EQ-5D-5 L index values ( $P > 0.05$ ) [[Table 2](#)].

Table 2

Adjusted limited dependent variable mixture model of EuroQoL-five-dimension-five levels index values

variable	Coefficient	SE	Z	P	95% CI
Gender					
Female	-0.0607	0.0837	-0.73	0.468	-0.2247-0.1033
Education					
Primary	-0.1918	0.1310	-1.46	0.143	-0.4485-0.0650
Secondary	-0.2460	0.1533	-1.60	0.109	-0.5464-0.0545
University degree	-0.1727	0.1549	-1.11	0.265	-0.4762-0.1309
Employment					
Unemployed	-0.0427	0.1154	-0.37	0.711	-0.2688-0.1835
Homemaker	-0.0609	0.1344	-0.45	0.651	-0.3242-0.2025
Retired	0.2113	0.1478	1.43	0.153	-0.0783-0.5010
Marital status					
Married	0.0654	0.1037	0.63	0.528	-0.1378-0.2686
Divorced or widow	-0.4014	0.1355	-2.96	0.003	-0.6670--0.1357
Age group (years)					
41-50	-0.1470	0.1064	-1.38	0.167	-0.3556-0.0616
51-60	-0.2545	0.1183	-2.15	0.031	-0.4864--0.0227
>60	-0.4925	0.1121	-4.40	<0.001	-0.7121--0.2729
Eye diseases					
Cataract	-0.1210	0.1273	-0.95	0.342	-0.3705-0.1285
ARMD	-0.0566	0.1119	-0.51	0.613	-0.2759-0.1628
Glaucoma	0.0101	0.1107	0.09	0.927	-0.2068-0.2270
Diabetic retinopathy	-0.2626	0.1815	-1.45	0.148	-0.6184-0.0932
Strabismus	-2.4499	0.1902	-12.88	<0.001	-2.8228--2.0770
VI severity					
Moderate VI	-0.8987	0.1014	-8.86	<0.001	-1.0974--0.6999
Severe VI	-0.9567	0.1293	-7.40	<0.001	-1.2100--0.7034
Blindness	-1.4060	0.0957	-14.69	<0.001	-1.5936--1.2184
Constant	4.3761	0.4879	8.97	<0.001	3.4199-5.3322

SE=Standard error, CI=Confidence interval, ARMD=Age-related macular degeneration, VI=Visual impairment



Today, evaluating and improving the QoL in people with disabilities is considered as a goal in rehabilitation programs.[36] The study aimed to describe the HRQoL among adults with VIs and the effect of demographic factors on it.

The results showed that the mean EQ-5D-5 L index and EQ-VAS score in the studied patients were 0.68 out of 1 and 72.46 out of 100, respectively. These results were in line with the results of a study by Kawashima *et al.* in Japan, who reported a QoL of 0.68 for patients with VIs.[37] In contrast to the present study, in some studies the QoL score for patients with VIs was higher than the amount reported in this study. In the study of Chatziralli *et al.*, for instance, EQ-VAS score and EQ-5D index in the studied patients were reported to be 79.1 and 0.89, respectively.[38] In the studies of Breheny *et al.*, on cataract patients[39] and Elsmann *et al.*, on patients with VIs (ages 18–25), the QoL score was 0.76 and 0.86,[40] respectively, which was higher than the score obtained in the present study. In the studies of Gyawali *et al.*[41] in Nepal and the study of Van Nispen *et al.*,[42] in the Netherlands, the mean score of QoL of patients was 49.53 out of 100 and 0.62 out of 1, respectively, which was less than the present study. Comparison of different results in the present study showed that the score of HRQoL in the studied patients was moderate. However, differences in the results of the present study with other studies can be related to differences in QoL assessment tools, differences in methods of assessing health status, diversity of patients by type of eye disease and differences in demographic and socioeconomic variables.

Based on the five dimensions of the EQ-5D questionnaire, at unable or extreme level, the most problems are related to the mobility dimension (12%). At severe level, the most problems are related to the usual activities (16.7%) and mobility dimension. Consistent with the results of the present study, in the study of Purola *et al.* (2022)[43] and Vu *et al.*,[44] patients reported the most problems in mobility dimensions and usual activities. Adigun also showed in his study that mobility problems were reported in 42.9% of patients.[4] Decreased visual function can impair movement and reduce the ability of individuals to perform daily activities, and this impairment in daily activities can lead to a decrease in their independence. Due to the significant effect of visual field defects on the dimensions of mobility and daily activities in the subjects, considering the existence of this defect in individuals as an influential factor will be essential in providing rehabilitation services.

The mean scores of HRQoL according to age groups showed that with increasing age, the mean of EQ-5D-5 L index and EQ-VAS score decreased. In the study by Asgari *et al.*, the mean score of total visual QoL decreased as age increased, which confirmed the results of the present study.[45] The results of a study by Esquinas *et al.*[46] and a study conducted in Nepal[41] on patients with VI showed that the QoL decreased as age increased. Since aging is known as a risk factor for visual problems and diseases and the age group of the elderly is one of the most important vulnerable visual groups, this statistically significant relationship between age and QoL seems logical.[47]

Regarding the severity of eye disease, the results showed that with increasing severity of visual problems, patients' QoL scores had decreased significantly. Consistent with the results of the present study, Macedo *et al.*[48] and Purola *et al.*[11] showed that QoL decreased with increasing visual acuity. In fact, the lower the visual acuity, the lower the QoL. Visual acuity could in some way indicate the QoL associated with vision, and according to studies,[4] the reduction of visual acuity further affects dependence and social performance and t

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son loses his independence, which is very important to him, and as a result, he will have a lesser presence in society, and his self-confidence and ability to do social work will decrease.

Examination of the mean EQ-5D-5 L index and EQ-VAS score in patients in terms of education showed that patients with nonuniversity education had significantly lower QoL scores, which was consistent with the results of the study by Esquinas *et al.*[46] According to the results of the present study, as the level of education of people raises from illiteracy to higher education, the QoL increases. The results showed that there was a positive relationship between the level of education and health outcomes and the level of education affected health in various ways, including visual health and HRQoL.[51,52] Through education, health literacy and culture are also promoted, and people's behavior would be more in line with health principles and at higher levels of education, health concerns would be greater.

Regarding marital status, the results showed that the QoL score in divorced or widow patients was lower than single and married ones. These results were consistent with studies by Yibekal *et al.* and Karyani *et al.*[53,54] Higher QoL for married people could be due to having more social support networks that made it easier for them to endure problems.

In this study, QoL was measured using the EQ-5D-5 L questionnaire, which was a general tool based on preferences, and provided the ability to compare the score of HRQoL in ocular patients with other patients. It has been found that the three-level questionnaire is not sensitive enough in some populations. Therefore, to reduce this limitation, a 5-level questionnaire has been designed that shows more details of the 5 dimensions of health status. In the present study, EQ-VT protocol was used for health state valuation. This protocol helped interviewers to match and standardize the interviews.

This study was conducted in one province and due to the geographical differences and socioeconomic status of patients in this province; the results of this study might not be generalizable to the whole country. Therefore, in order to carry out national interventions, it is recommended to conduct studies on a larger scale and with a larger sample size. Also, in this study, only the EQ-5D-5 L questionnaire was used to assess HRQoL in patients with vision problems. Therefore, in assessing the QoL of patients with VIs, while using disease-specific measure, other generic preference-based measures such as HUI and 15D were used.

## Conclusions

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The results showed that HRQoL in patients with VIs was moderate, and these people had more problems in mobility and usual activities. HRQoL also decreased in patients with high disease severity, higher age, lack of a spouse, retirement, and nonacademic education. As a result, it was necessary to pay attention to socioeconomic and demographic characteristics in eye health policies to take intervention and preventive measures effectively to use them in population groups that use these services the least. Further studies can be conducted to improve the quality of vision and visual QoL for ocular patients in Iran by designing and implementing interventions for vulnerable groups as well as priority areas in the visual QoL measure the effectiveness of interventions.

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## Conflicts of interest

There are no conflicts of interest.

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