

# Vision-Related Quality of Life and Associated Factors Among an Adult Population with Glaucoma Attending a Comprehensive Specialized Hospital, Northwest Ethiopia

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**Background:** Glaucoma is a group of ocular conditions that leads to irreversible blindness. It can affect the vision-related quality of life in many ways. In Ethiopia, limited information is available on how and to what extent the vision-related quality of life of the glaucoma population has been affected.

**Objective:** This study attempted to assess the vision-related quality of life and associated factors among an adult population with glaucoma attending Felege Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia.

**Methods:** The cross-sectional study was conducted on the adult population with glaucoma attending Felege Hiwot Comprehensive Specialized Hospital. Systematic random sampling was employed to select 319 study participants. Descriptive and summary statistics were calculated. Simple and multiple linear regressions were performed to determine factors associated with vision-related quality of life. A p-value of <0.05 in multivariable regression was considered statistically significant at a 95% confidence level.

**Results:** The mean glaucoma quality of life-15 score in this study was  $47.85 \pm 15.41$ . Below primary education, primary education, visual acuity of the better eye, visual acuity of the worse eye, and severe glaucoma were significantly associated with the glaucoma quality of life-15 score.

**Conclusion and Recommendation:** The study observed poorer vision-related quality of life in the glaucoma population than previously reported in Ethiopia and around the globe. The vision-related quality of life was significantly associated with educational status, visual acuity of the better and worse eye, and stage of glaucoma in the better eye. Educating the glaucoma population on the nature of the disease, advice on early presentation, and better-coping strategies for the condition are warranted.

**Keywords:** vision, quality of life, glaucoma, Ethiopia

## Introduction

Glaucoma is a group of eye diseases signified by permanent optic nerve damage associated with progressive visual field loss.<sup>1</sup> It is one of the leading causes of irreversible blindness in adults aged 50 years and above worldwide.<sup>2,3</sup>

Globally, 64.3 million (3.54%) people aged 40–80 were affected by glaucoma in 2013, with Asia and Africa accounting for 60% and 13% of the world's total glaucoma cases, respectively. The global magnitude is estimated to rise to about 111.8 million in 2040, disproportionately affecting people living in Asia and Africa.<sup>4–6</sup>

In a recent epidemiological study conducted in Ethiopia on voluntary people coming for a glaucoma screening program at Jimma University alone, 10.24% were diagnosed to have glaucoma.<sup>7</sup> The increasing magnitude of the problem, along with other chronic aging eye diseases and an increasing number of aged population in the world today, is posing a significant healthcare burden.<sup>2,8</sup>

Quality of Life (QOL): an important measure of the physical, emotional, and social well-being of a person,<sup>9</sup> is a highly subjective broad-ranging concept as it can refer both to the experience an individual has of his or her own life and to the living conditions in which individuals find themselves.<sup>10</sup> So, it is influenced in a complex way by the person's physical health, level of independence, social relationships, personal beliefs, and psychological state.

Vision-related quality of life is related to visual function and represents the extent to which vision affects activities of daily living (ADL) and the social, emotional, and economic well-being of an individual.<sup>11</sup> Glaucoma affects the population's Vision-related quality of life (VRQOL) in several ways: reduced peripheral Visual Field (VF) and visual acuity (VA), inconvenience of daily applications of eye drops, potential side effects of treatments, increment of psychological and economic burden.<sup>12–14</sup>

In the advanced stages of the disease, patients may also experience difficulty in recognizing faces, navigation, reading activities, watching television, noticing objects in their peripheral visual area, and adapting to different levels of light. Moreover, glaucoma is an independent risk factor for falling accidents. The adverse impacts of advanced glaucoma lead to increased healthcare expenditures and decreased VRQOL, and overall QOL as well.<sup>13,15</sup>

The clinicians often focus on the objective signs of disease severity such as intraocular pressure level and optic nerve appearance, whereas what is of interest to patients is the extent to which these factors influence functional status, emotional well-being, and eventually their health-related quality of life.<sup>16</sup> Only a few clinicians discuss the specific glaucoma quality of life with their patients.<sup>17</sup> However, it is crucial to consider the patient's subjective interpretation of the disease and the way it affects them outside the clinic. Patient's perception of the disease and its treatment can also play a huge role in enhancing QOL.<sup>18</sup> Thus, maintaining the QOL of glaucoma patients should be considered one of the most important goals for glaucoma treatment and follow-up.

Despite the globally increasing magnitude of the disease along with its impacts on the QOL of patients, sufficient information is not available in different parts of our country regarding how and to what extent the QOL of the glaucoma population is affected. So, this study aimed to assess VRQOL and associated factors among an adult population with glaucoma attending Felege Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia.

## Methods and Materials

### Study Design and Period

A cross-sectional study was applied to the glaucoma population. Participants were recruited in the study via a systematic random sampling scheme from June 18 to August 20/2021.

### Source and Study Population

Felege Hiwot Specialized Hospital, with its integrated ophthalmology unit, is one of the few eye care centers situated in Northwest Ethiopia. The center has been providing comprehensive eye care services for millions of people in the city of Bahir Dar and the surrounding. Based on data obtained from the glaucoma follow-up registration book, there were around 360 glaucoma patients attending at ophthalmology unit during the preceding month. Ophthalmologists, optometrists, and ophthalmic nurses are involved in the diagnosis, management, and follow-up of patients with glaucoma in the center. The target populations of the study are adult patients previously diagnosed with glaucoma with a minimum of six months duration, attending the Felege Specialized Hospital Ophthalmology Unit.

### Exclusion Criteria

- Glaucoma population who had mobility, cognitive, and hearing problems.
- Glaucoma population who had a history of incisional eye surgery in the last 3 months.
- Glaucoma population who were visually significant cataracts (greater than stage 2 LOCS III Classification).
- Glaucoma population who were high refractive errors >5 Diopter.
- Glaucoma population who were having age-related macular degeneration and other retinal diseases which may affect the vision-related quality of life.

## Sample Size Calculation

The sample size for the outcome variable was determined by using the single population mean formula, considering the following assumptions: Level of significance ( $\alpha$ ) = 5% (with a confidence level of 95%), Marginal error (d) = 4% Mean Glaucoma Quality of Life taken from a similar study = 46.3 ( $\pm 35$ )<sup>13</sup> and Z-value of 1.96 was used at 95% CI while n = Sample size.

$$n = \left( Z \frac{\alpha}{2} \right)^2 \frac{\sigma^2}{d^2} = (1.96)^2 \frac{(35^2)}{(4)^2} = 295$$

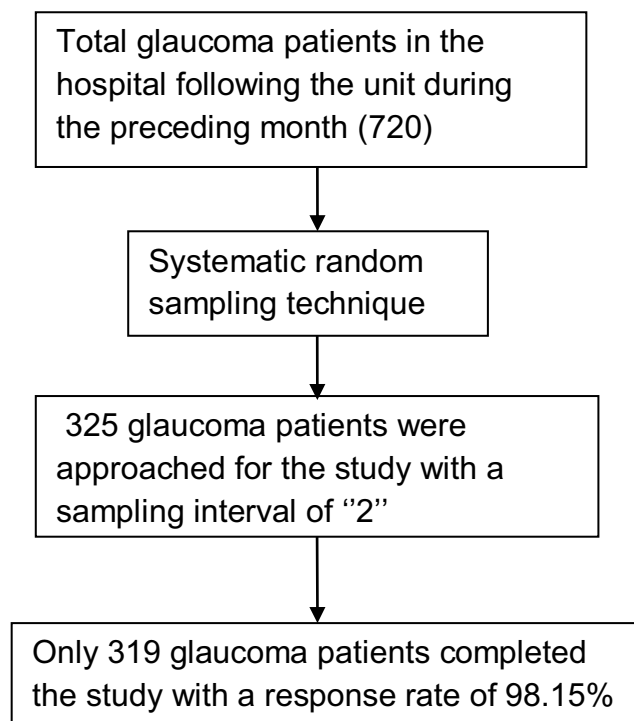
After adjusting for a 10% for non-response rate and incomplete patient chart the total maximum sample size was determined to be 325. A sampling interval of 2 was decided by dividing the number of glaucoma population over two months (720) to the final calculated sample size of 321 (Figure 1).

## Ethical Considerations

The study adhered to the tenets of the Declaration of Helsinki and approval was sought and obtained from the Ethical Review Board of the College of Medicine and Health Sciences, University of Gondar under Institutional Review Board Number 641/6/21. Written informed consent was obtained from all voluntary participants. The participants were informed of the study would not inflict any harm on them. Neither the data collectors nor the authors were allowed to access the personal identifiers of participants. The confidentiality of the study participants was maintained at all stages of data collection and processing.

## Operational Definitions

- Vision-Related Quality of Life: a QOL related to visual function measured by a mean score of the GQL-15 questionnaire.<sup>19</sup>
- Mild Glaucoma: Early glaucomatous disc features (Vertical CD ratio < 0.65).<sup>20</sup>
- Moderate Glaucoma: Moderate glaucomatous disc features (Vertical CD ratio 0.7–0.85).<sup>20</sup>



**Figure 1** A flow chart showing the potential participants and sampling.

- Advanced or Severe Glaucoma: Advanced glaucomatous disc features (Vertical CD ratio > 0.9).<sup>20</sup>
- Distance vision impairment<sup>21</sup>
  - Mild visual impairment: VA worse than 6/12 to 6/18.
  - Moderate visual impairment: VA worse than 6/18 to 6/60.
  - Severe visual impairment: VA worse than 6/60 to 3/60.
  - Blind: VA worse than 3/60.

## Data Collection Procedures and Quality Control

Data were collected using a checklist of clinical examinations, and a pretested, structured questionnaire. The questionnaire consists of the following parts; part I: which contains questions on socio-demographic characteristics, part II: GQL-15 questionnaire<sup>19</sup> to assess VRQOL, and part III: which contains a checklist of clinical variables.

The GQL-15 has 15 questions with each question having five answers represented by values ranging from 0 to 5 (0 = Abstinence from activity owing to non-visual reasons, 1 = No difficulty, 2 = A little bit of difficulty, 3 = Some difficulty, 4 = Quite a lot of difficult, 5 = Severe difficulty). This tool has four subscales which include: Central and Near Vision (Reading newspapers, sewing, handcrafting, and Recognizing faces), Peripheral vision (Walking on uneven roads, Tripping over objects, Seeing objects coming from the side, Walking on steps stairs, Bumping into objects and Judging distance of foot to step/surb), Glare and dark adaptation (Walking after dark, Seeing at night, Adjusting to bright lights, Adjusting to dim lights, Going from the dark room and vice versa and Finding dropped objects) and Outdoor mobility (Crossing the road).

The data were collected by three trained optometrists under the supervision of one ophthalmic officer. Eligible participants with glaucoma were approached by the optometrists, after completing their follow-up evaluations and treatment at the glaucoma clinic. The local language (Amharic) translated structured questionnaire was administered through the face-to-face interview by the data collectors. All other required clinical variables were retrieved from patients' medical folders using a data collection checklist.

Before the actual data collection, the questionnaire was translated and pretested on five percent of the sample size (16 glaucoma patients) at Gondar Tertiary Eye Care Center, Northwest Ethiopia. Necessary modifications and adjustments were made to the final questionnaire accordingly. Internal consistency was assessed using Cronbach's  $\alpha$  value (0.94). Training and supervision of the data collectors were done to ensure the quality of the data. Finally, the completeness and consistency of collected data were checked by the supervisor and the principal investigator (PI).

## Data Processing and Statistical Analyses

The data were entered into EpiData version 4.6.0.4 software and exported to and analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 26. The descriptive statistics were summarized and presented with frequency, percentage, median, mean, standard deviation, and range. A continuous score for GQL-15 questions was taken as a primary outcome of the study. Multiple linear regressions were performed to determine factors associated with quality of life in the glaucoma population. All tests were two-sided, and variables with a p-value < 0.05 in multivariable linear regression were considered statistically significant at a 95% confidence level.

The response of study participants to the GQL-15 questionnaire ranges from 15 to 75, and the mean of the responses was calculated to determine the quality of life among participants, with higher numbers denoting poorer and lower numbers the better quality of life.

The assumptions of Linear Regression were checked for a linear relationship, multicollinearity, normal distribution of the residuals, homoscedasticity, and outliers. Variables were assessed for normality using the Kolmogorov–Smirnov test. For normally distributed variables, the mean and standard deviation were presented.

Variables including residence, educational status, VA of the better and worse eyes, stages of glaucoma for better and worse eyes, and Visual Impairment were correlated with the quality of life in bivariable linear regression. In multivariable linear regression, Visual Impairment (VI) and VA of the better eye were strongly correlated in multicollinearity checks. Then the variable that did not explain the outcome variable (VI) was excluded. Finally, the variables which

include residence, educational status, VA, and stage of glaucoma for the better and worse eyes were properly fitted into the model.

## Results

### Socio-Demographic Characteristics of the Study Participants

A total of 319 glaucoma population participated in this study with a response rate of 98.15%. The median age of the participants was 60 years, with a range from 18 to 87 years and 241 (75.5%) were male. More than half of the respondents, 165 (51.7%), were rural residents, and 174 (54.5%) were farmers. The majority of the respondents, 207 (64.9%) were below primary education and about 148 (71.5%) of these were rural residents. More than three-fourths, 246 (77.1%) of the participants were married, and 295 (92.5%) were orthodox Christian religion followers (Table 1).

**Table 1** Socio-Demographic Characteristics of the Study Participants

Variables	Frequency	Percentage
<b>Sex</b>		
Male	241	75.5
Female	78	24.5
<b>Age</b>		
18–52	86	27.0
53–60	77	24.1
61–67	77	24.1
>67	79	24.8
<b>Marital Status</b>		
Single	9	2.8
Married	246	77.1
Divorced	24	7.5
Widowed	40	12.5
<b>Religion</b>		
Orthodox	295	92.5
Protestant	14	4.4
Other Religions*	10	3.1
<b>Residence</b>		
Urban	154	48.3
Rural	165	51.7
<b>Educational Status</b>		
Below Primary Education	207	64.9
Primary Education (1–8)	38	11.9
Secondary Education (9–12)	37	11.6
College and above	37	11.6
<b>Occupation</b>		
Farmer	174	54.5
Employed	57	17.9
Retired	29	9.1
Dependent on Family	16	5.0
Housewife	13	4.1
Other Occupation**	30	9.4

**Note:** \*Muslim, Catholic\*\*Student, Security, Priest, Monk, Driver, Merchant and Day-Laborer.

## Clinical Characteristics of the Study Participants

More than half, 191 (59.9%) of the study participants had visual impairment of which 107 (33.5%) were having moderate visual impairment. Blindness was reported among 20 (6.3%) participants. Nearly all of the participants, 290 (90.9%), of the participants had a bilateral diagnosis of glaucoma. About 287 (90.0%) participants had open-angle glaucoma; the rest had angle closure and pseudo-exfoliative glaucoma. Nearly half, 155 (48.6%), of the study participants, were in the severe stage of the condition. All participants were on topical anti-glaucoma medications, and 34 (10.7%) of them had additional systemic anti-glaucoma drugs. The majority of the glaucoma population, 237 (74.3%) had 2 or more anti-glaucoma medications (Table 2).

**Table 2** Clinical Findings of the Study Participants with Glaucoma

Variable	Frequency	Percent
<b>Visual Impairment</b>		
Normal	128	40.1
Mild Impairment	38	11.9
Moderate Impairment	107	33.5
Severe Impairment	26	8.2
Blind	20	6.3
<b>Type of Glaucoma</b>		
Open-angle glaucoma	287	90
Angle-closure glaucoma	22	6.9
Pseudo-exfoliative glaucoma	10	3.1
<b>Laterality of Glaucoma</b>		
Unilateral	29	9.1
Bilateral	290	90.9
<b>Stage of Glaucoma (Better Eye)</b>		
Mild	97	30.4
Moderate	67	21
Advanced (Severe)	155	48.6
<b>Duration of Diagnosis (Years)</b>		
≤1	105	32.9
2–5	158	49.5
≥6	56	17.6
<b>Number of anti-glaucoma medications</b>		
< 2	82	25.7
≥ 2	237	74.3
<b>Anti-glaucoma medication use</b>		
Unilateral	56	17.6
Bilateral	263	82.4
<b>Form medications</b>		
Topical only	285	89.3
Topical and systemic	34	10.7
<b>Glaucoma surgeries</b>		
Unilateral	23	7.2
Bilateral	8	2.5
None	288	90.3
<b>Other Ocular Comorbidity*</b>		
Yes	114	35.7
No	205	64.3

**Note:** \*Pseudophakia, Aphakia, Uveitis, Pterygium.

## Vision-Related Quality of Life of Participants

Multiple linear regression analyses indicated that socio-demographic variables explained relatively a small proportion (23.7%) of the variance in the GQL-15 summary scores than clinical factors (48.7%). The socio-demographic and clinical variables together explained the variance in the GQL-15 score of 50.8%.

The mean summary score of GQL in the present study was 47.85 (95% CI; 46.11–49.62). The score was 42.51 among urban and 52.84 for rural residents. Among all domains of GQL-15, the highest score was reported for the dimension of glare and dark adaptation ( $51.95 \pm 15.38$ ), followed by central and near vision ( $46.76 \pm 18.63$ ) and outdoor mobility ( $45.61 \pm 22.17$ ), and the lowest scores were for the peripheral vision ( $44.31 \pm 18.13$ ) (Table 3).

The three most affected ADLs reported for all participants in this study were adjusting to bright lights ( $3.78 \pm 1.4$ ), going from the dark room and vice versa ( $3.7 \pm 1.2$ ), and adjusting to dim lights ( $3.63 \pm 1.3$ ). Bumping into objects ( $2.53 \pm 1.5$ ) was the least affected GQL-15 item.

## Factors Associated with Vision Related Quality of Life

Among the variables fitted into the multiple linear regression models: educational status (Below Primary, and Primary Education), VA of the worse and better eye, and severe stage of glaucoma in the better eye showed a statistically significant association with VRQOL of glaucoma patients at 95% confidence level.

Compared to the participants with the educational level of college and above, participants who were below primary education level were associated with a 5.42 reduction in the quality of life, and those participants who had an educational level of primary education had a 5.9 less GQL score, keeping all other variables constant. In addition, a unit increase in Snellen's decimal equivalent of VA of the better and worse eyes improves the glaucoma-related quality of life by 14.80 and 14.92 times, respectively, holding other variables constant.

Additionally, participants with a severe form of glaucoma had an 8.02 less quality of life score as compared to those with early stage, while other variables are kept constant (Table 4).

## Correlations of Factors with Vision-Related Quality of Life of Participants

A point bi-serial correlation was run to determine the relationship between predictors and each domain of GQL-15. Educational status of those below primary education and those in secondary education were significantly correlated with all subscales of GQL-15. (Figure 2) Visual acuity of the better and worse eyes, and the severe stage of both the better and worse eyes were also significantly correlated with the entire subscales of GQL-15. Furthermore, the moderate stage of glaucoma on the better eye was significantly correlated with the Central and Near Vision and the Peripheral Vision subscales, whereas the moderate glaucoma of the worse eye was significantly correlated with all except the Glare and Dark Adaptation subscale (Table 5).

## Distribution of GQL-15 Scores by Visual Impairment

The following diagram shows an increase in the mean GQL-15 scores as VA decreases (as the severity of VI increases) from the normal to the blindness stage (Figure 3).

**Table 3** Distribution of the Four Subscales of the GQL-15 Scores in Glaucoma Patients

Domain	Mean ( $\pm$ SD) (75%)	(95% CI)
Central and Near vision	46.76 (18.63)	44.69–48.88
Outdoor mobility	45.61 (22.17)	43.07–47.96
Peripheral vision	44.31 (18.13)	42.29–46.3
Glare & Dark adaptation	51.95 (15.38)	50.39–53.62
GQL-15 Score	47.85 (15.41)	46.11–49.62



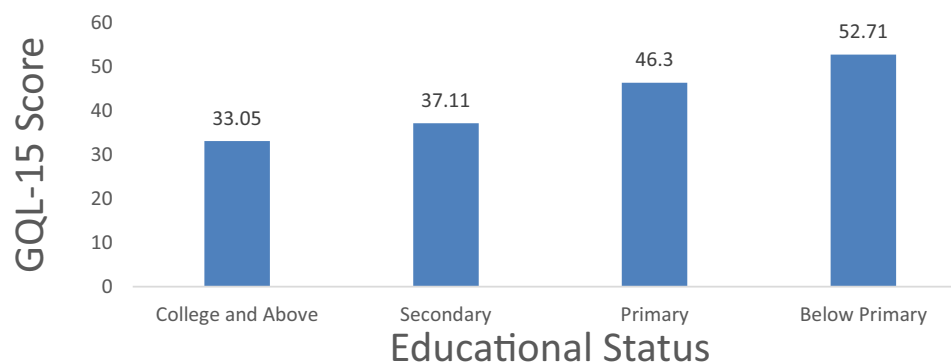
**Table 4** Multivariable Analysis of Variables with Vision-Related Quality of Life Among the Study Participants

Variables	B Coefficients	P-value
<b>(Constant)</b>	43.64	0.000
<b>Sociodemographic</b>		
Urban Residence	<b>Reference</b>	
Rural Residence	1.39	0.359
College and above	<b>Reference</b>	
Below Primary Education	5.42	0.032
Primary Education	5.9	0.031
Secondary Education	0.3	0.910
<b>Clinical Characteristics</b>		
Visual Acuity <sup>a</sup>	-14.8	0.000
Visual Acuity <sup>b</sup>	-14.9	0.000
Early Glaucoma <sup>a</sup>	<b>Reference</b>	
Moderate Glaucoma <sup>a</sup>	-0.31	0.875
Severe Glaucoma <sup>a</sup>	8.02	0.000
Early Glaucoma <sup>a</sup>	<b>Reference</b>	
Moderate Glaucoma <sup>b</sup>	4.97	0.067
Severe Glaucoma <sup>b</sup>	3.72	0.166
<b>R square</b>	0.508	
<b>Adjusted R Square</b>	0.492	

**Notes:** Dependent Variable: GQL-15 Summary score, aBetter eye, bWorse eye. The overall regression model was significant,  $F(10,308) = 31.748$ ,  $p\text{-value} = 0.000$ ,  $R^2 = 0.508$ , Adjusted  $R^2 = 0.492$ .

## Vision-Related Quality of Life of Participants by Stage of Glaucoma

The GQL-15 mean scores and all four subscale scores showed a uniform rise in their value from mild to severe stages of the disease, indicating that all four visual parameters are affected in glaucoma, and worsen with an increase in the disease severity (Figure 4).



**Figure 2** Comparison of GQL-15 Summary Scores by Educational Status among glaucoma patients attending Felege-Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia, 2021.



**Table 5** Comparison of Linear Correlations of GQL-15 Subscales Scores with the Predictive Variables

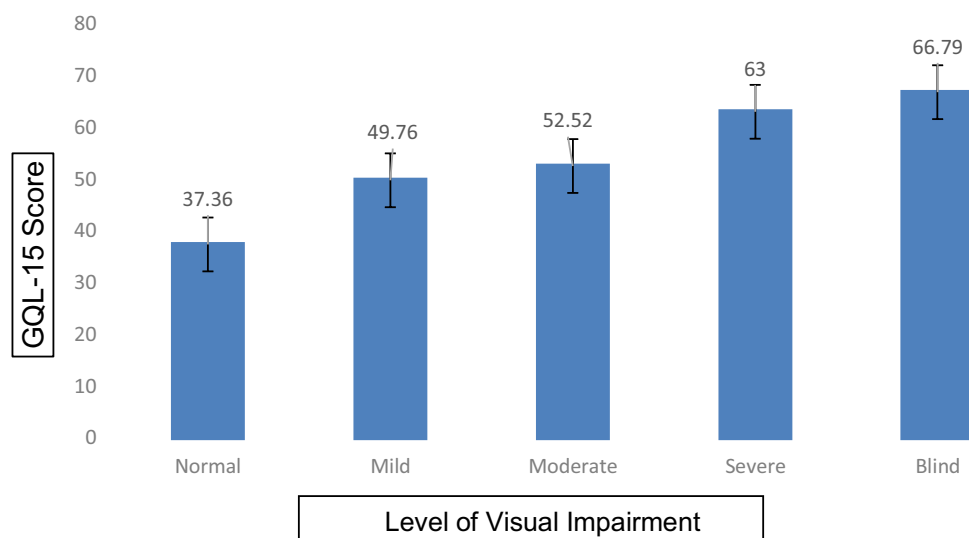
Variables	Central and Near Vision	Outdoor Mobility	Peripheral Vision	Glare and Dark Adaptation
Below Primary Educ.	0.353(p 0.000)	0.425(p 0.000)	0.434(p 0.000)	0.355(p 0.000)
Primary Education	-0.011(p 0.419)	-0.063(p 0.132)	-0.061 (p 0.139)	-0.006 (p 0.459)
Secondary Education	-0.196(p 0.000)	-0.295(p 0.000)	-0.272(p 0.000)	-0.189(p 0.000)
Visual Acuity <sup>a</sup>	-0.593(p 0.000)	-0.398(p 0.000)	-0.552(p 0.000)	-0.494(p 0.000)
Visual Acuity <sup>b</sup>	-0.564(p 0.000)	-0.439(p 0.000)	-0.519(p 0.000)	-0.464(p 0.000)
Moderate Stage <sup>a</sup>	-0.158 (p 0.002)	-0.046(p 0.209)	-0.144(p 0.005)	-0.076 (p 0.089)
Severe Stage <sup>a</sup>	0.457(p 0.000)	0.373(p 0.000)	0.467(p 0.000)	0.353(p 0.000)
Moderate Stage <sup>b</sup>	-0.229(p 0.002)	-0.193(p 0.000)	-0.205(p 0.000)	-0.122(p 0.015)
Severe Stage <sup>b</sup>	0.411(p 0.000)	0.381(p 0.000)	0.417(p 0.000)	0.335(p 0.000)

Note: aBetter eye, bWorse eye.

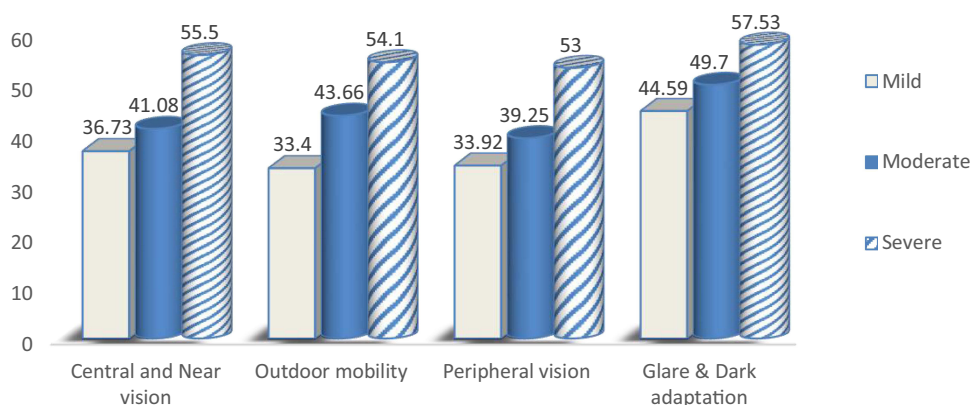
## Discussion

Glaucoma is a chronic, progressive group of eye disorders that requires long-term treatment and frequent follow-ups. The patients are at increased risk of various complications secondary to treatments and the disease itself contributing to poor VRQOL.<sup>22</sup> Thus, the present study evaluated the Vision-Related Quality of Life of patients with glaucoma at Felege Hiwot Tertiary Hospital, Northwest Ethiopia.

The mean VRQOL score among patients with glaucoma in the current study using GQL-15 was 47.85 (95% CI, 46.11–49.62). The finding was consistent with that of previously conducted in Gondar, Ethiopia,<sup>13</sup> 46.3. However, the finding was higher denoting poorer VRQOL, compared to the findings of the previous studies conducted in Nigeria, 24.07,<sup>23</sup> India, 26.0,<sup>24</sup> China; 26.0,<sup>25</sup> 28.79,<sup>14</sup> and 31.86,<sup>22</sup> Australia, 30.5,<sup>26</sup> England, 22.09<sup>19</sup> and the Netherlands, 28.<sup>27</sup> These discrepancies may be explained by various factors including variation in the socio-economic and clinical characteristics of the study participants, sampling methods, and inclusion and exclusion criteria used by the studies.



**Figure 3** Comparison of GQL-15 summary scores by visual impairment status among glaucoma patients attending Felege-Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia, 2021.



**Figure 4** Comparison of GQL-15 subscale scores by stage of disease among glaucoma patients attending Felege-Hiwot Comprehensive Specialized Hospital, Northwest Ethiopia, 2021.

**Abbreviation:** GQL, General Quality of Life.

For instance, studies conducted in Nigeria,<sup>23</sup> China,<sup>25</sup> and the Netherlands<sup>27</sup> were merely involving participants having ocular hypertension and primary open-angle glaucoma as a case. Similarly, glaucoma in England<sup>19</sup> was determined based on visual field loss with normal visual acuity. These would limit the number of advanced glaucoma and in turn, contribute to a lower mean score of VRQOL against the present study. Besides, twenty-five percent of the participants in the current study were aged above 67 years compared to the previous studies.<sup>14,19</sup> This might have also contributed to the poorer VRQOL in the current study, as the quality of life gets low in the older age groups.<sup>13</sup>

Additionally, the late presentation of patients in Sub-Saharan Africa particularly the present study area, with advanced stage of the disease can cause significant peripheral and central visual impairment.<sup>28</sup> These impairments potentially challenge the performance of ADL, moving around, finding objects, and adapting to changing lighting conditions, contributing to a higher GQL-15 score reported in the current study.

Thus, creating awareness among the society by giving health education about the overall eye exams, and particularly, glaucoma, for screening and early detection of glaucoma, prevent the late presentation of patients at an advanced stage of the condition.

The mean scores of the four GQL-15 subscales, namely, “Central and Near vision”, “Outdoor mobility”, “Peripheral vision” and “Glare and Dark adaptation” were 46.76, 45.61, 44.31 and 51.95 respectively, indicating that, greater difficulties were noted in the glare and dark adaptation domain. This pattern was supported by previous reports of studies conducted in Ethiopia,<sup>13</sup> Nigeria,<sup>23</sup> India,<sup>24</sup> China,<sup>14,22</sup> and Australia.<sup>26</sup> The possible justification for such a pattern might be because glare sensitivity is one of the biggest side effects of glaucoma-related fear of light resulting from the intra-ocular pressure rise in the eye.

The glare sensitivity which gets worse under sunlight and artificial light exposure makes a challenging performance of ADL such as driving at night and outdoor activities. The high proportion of participants with advanced glaucoma in the present study could also reflect the pattern, as patients with advanced or severe glaucoma have more difficulty with glare than with mild or moderate glaucoma.<sup>29</sup>

Additionally, in the present study, participants with primary education and below were significantly associated with higher mean GQL-15 scores. Conversely, the association signified those participants with low educational status showed poorer VRQOL compared with high educational status.

A similar finding was revealed by studies in China<sup>14,30</sup> and Greek.<sup>31</sup> The association could be explained in a way that, participants with lower educational status might not have adequate information on the nature of the disease.<sup>32–34</sup> Thus, they could not adopt a good practice pattern<sup>35</sup> (better coping mechanism) and this ultimately compromises their vision-related quality of life.

In addition, a unit increase in Snellen’s decimal equivalent of VA of the better and worse eyes improves the vision-related quality of life by 14.8 and 14.9 in the present study respectively. This trend was supported by previous studies in Ethiopia,<sup>13</sup> China,<sup>14,30</sup> Australia,<sup>26</sup> Slovakia,<sup>36</sup> and Brazil.<sup>37</sup> This could be because visual acuity is a major factor

controlling the activities of daily living which were included in the four domains of glaucoma-related quality of life, which enhances the overall vision-related quality of life.

Moreover, the severe stage of glaucoma was significantly associated with a reduction of VRQOL in the current study, consistent with other previous studies done in Ethiopia,<sup>13</sup> India,<sup>24</sup> China,<sup>14</sup> Australia,<sup>12,26</sup> and Brazil.<sup>37</sup> In the advanced stage of glaucoma, all the visual functions including mobility-related components of quality of life will be significantly affected which would, in turn, affects the whole vision-related quality of life.<sup>38,39</sup> Severe visual field loss in advanced glaucoma can affect driving activities, the psychological condition, and peripheral and central vision which ultimately reduce the overall VRQOL.<sup>40,41</sup>

## Limitation

Due to the cross-sectional nature of the study, the association between Vision-Related Quality of Life and the predictive variables may not be causal. Unlike some other studies which have used visual field assessment for staging, we used a vertical CD ratio-based staging in this study, because we had no visual field testing service in the study area, and this may lead to inconsistency of results and make difficult comparisons with the findings of the previous studies.

## Conclusion

The study observed poorer vision-related quality of life in a glaucoma population attending Felege Hiwot Referral Hospital Northwest Ethiopia than previously reported in Ethiopia and around the globe. The vision-related quality of life was significantly associated with educational status, visual acuity of the better and worse eye, and stage of glaucoma in the better eye.

The poorer quality of life in the study area reflects the need to consider educating the glaucoma population on the nature of the disease and advise them on the better-coping strategy of glaucoma in the overall care and management of the condition. Further study with a prospective longitudinal cohort design for a better assessment of the quality of life in glaucoma is warranted.

## Abbreviations

ADL, Activity of Daily Living; CD, Cup to Disc; CI, Confidence Interval; GQL, General Quality of Life; LOCS III, Lens Opacity Classification System; QOL, Quality of Life; VA, Visual Acuity; VRQOL, Vision Related Quality of Life.

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The authors report no conflicts of interest in this work.

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