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ORIGINAL ARTICLE

Validity and Reliability of the Turkish Version of the Glaucoma Quality of Life-15 Scale

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Abstract

Introduction: Our aim was to translate the Glaucoma Quality of Life-15 Scale (GLQ-15) into Turkish and assess the reliability and validity of the adapted scale.

Methods: This was a cross-sectional study. One hundred and twenty-two with the primary open-angle glaucoma were evaluated using the Turkish version of the Glaucoma Quality of Life-15 and National Eye Institute Visual Function Questionnaire-25 (NEI-VFQ-25). Internal consistency and test-retest reliability at a 2-week interval were evaluated. Floor and ceiling effects and factor analysis was performed to test the validity.

Results: Cronbach's alpha values were ranged from 0.65 to 0.95 which indicates that the internal consistency values are moderate to excellent and intraclass correlation coefficients were ranged from 0.85 to 0.95 between test and retest assessments. The Turkish version of the Glaucoma Quality of Life-15 is negatively and moderate to strongly correlated with the scale and the NEI-VFQ-25, as expected.

Discussion and Conclusion: The Turkish version of the GLQ-15 is a valid and reliable instrument to evaluate the level of quality of life in patients with glaucoma. Our results support the potential usefulness of this questionnaire in clinical practice.

Keywords: Cross-cultural adaptation; glaucoma; quality of life; reliability; validity.

Glaucoma is defined as a major cause of blindness or irreversible visual field loss around the globe[1,2]. It is expected that glaucoma may affect 111.8 million people in 2040 by increasing 74% from 2020 to 2040 and Asian countries probably will include most of these patients[2]. The primary open-angle glaucoma (POAG) is the most prevalent subtype of the glaucoma[3]. Glaucoma is generally characterized by vision-related findings such as a decrease in visual acuity and peripheral visual field loss[4]. Visual acuity performance, visual field detection, contrast sensitivity, and visual-evoked potentials are important objective tools to evaluate the effects of glaucoma on patients' visual functions[5]. Glaucoma-related symptoms lead to poorer quality of life[6,7] not only due to visual impairments but also treatment side effects, psychological complaints, and financial problems caused by the disease[8].

Quality of life measurements can be served as supplemental materials for determining the clinical status of glaucoma patients[1]. These tools are useful to visualize the effects of glaucoma on patients' daily functions and visual impairments[3]. One of the quality of life of mea-

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surement tools that have been developed to determine the effects of glaucoma is the Glaucoma Quality of Life-15 (GQL-15) scale which was developed by Nelson et al.[9] in 2003. This scale consists of 15 Likert-type items and each item is scored between 0 and 5 as "0" means avoiding the activity for reasons other than vision loss, "1" means no difficulty, and "5" means severe difficulty. Higher scores indicate a decreased level of quality of life. The GQL-15 scale evaluates central and near vision (two items), peripheral vision (six items), dark adaptation (six items), and outdoor mobility (one item). Total score and subscale scores can be calculated. This scale is described as simple and easy to administer during the clinical practice and several studies found significant relationships between GQL-15 scale and clinical tools[10]. The validity and reliability of the GQL-15 scale was previously studied in Chinese, Persian, and Serbian populations[11-13].

The purpose of this study was to translate the GQL-15 scale into Turkish and to evaluate the measurement properties of this version.

Materials and Methods

The present study is a cross-cultural adaptation and validation study that aims to develop the Turkish version of the GQL-15 scale. Patients were recruited from a local glaucoma clinic from May 2019 to March 2020. After completing the translation process, we started to include patients from the glaucoma spesific clinical days which were designed as once a week from the beginning of May 2019. The re-test procedure was conducted with a phone-call. At first interview, the scales were completed face-to-face. The sample size needed for our study was determined based on the information of seven patients per item; thus, a minimum number of 105 participants were needed and our final sample size was 126 patients[14].

This study was approved by the Research Ethics Committee (ATADEK 2019-7/2) and registered as a clinical trial (Clinicaltrials.gov NCT03967145). The methods of this study were completed according to the Declaration of Helsinki guidelines for human subject research. Informed consent was obtained from all participants. Participants' eligibility criteria were as; diagnosed with POAG minimum 6 months before participation, above 20-years-old, have cognitive abilities to answer the questions. Participants were excluded if they; had surgery within the 6 months before the study, have another ophthalmological disease (retina or optic nerve pathologies) that can lead to visual field loss or decrease in visual acuity.

The first part of the study was to complete the cross-cultural adaptation process of the GQL-15 scale into Turkish in accordance with the international guidelines[15]. The second part of the study was to assess the validity and reliability of the translated GQL-15 scale. Before starting the cross-cultural adaptation process, the permission was obtained from the author of the original instrument to perform the adaptation study. The GQL-15 was translated into Turkish by two bilingual independent translators that one of them was an ophthalmologist who is not involved in this study and the other one is a professional translator. The third bilingual translator and another ophthalmologist who is not involved in the first translation process generated the first translated version together. The generated Turkish version was back-translated into the original language by two independent professional translators who were not aware of the original English version. The forward and backward translated versions were reviewed and discussed with a committee comprised of the translator ophthalmologists, translators, and another glaucoma specialist ophthalmologist; then, the prefinal version of the scale has been created by this group. The committee did not suggest any changes within the Turkish version of the scale. The prefinal version of the GQL-15 tested with ten individuals with glaucoma who had fulfilled the inclusion critera. They were asked to confirm the understandability of the scale and they were not included into the study sample. After external proofreading to confirm the right Turkish language usage throughout the scale, the final Turkish GQL-15 scale was completed.

Demographic variables and disease-related information were recorded and participants were asked to complete the GQL-15 and the National Eye Institute Visual Function Questionnaire-25 (NEI-VFQ-25) forms on paper under the supervision of the same researcher (glaucoma specialist). To evaluate convergent validity, we have decided to use NEI-VFQ-25 which was developed to evaluate the quality of life of patients with vision problems. This scale consists of 25 items in 12 subscales as follows: general vision, general health, mental health, dependency, social function, role difficulties, distance vision, peripheral vision, driving, near vision, color vision, and ocular pain. Each answer has predefined numerical response values. In the scoring of the scale, each subtitle can be coded and transformed to a 0–100 scale in which "0" represents the worst situation, while "100" corresponds to the best situation[16]. The NEI-VFQ 25 has been translated and validated into Turkish and was accepted as a reliable and valid tool to assess vision-related functions[17].

All patients were requested to complete the T-GQL-15 2 weeks after the first interview. Patients were asked to rate the change of their condition with 5-point Global Rating of Change (GRoC) and the test-retest reliability analysis was performed only with the patients reported as "0-no change" on the GRoC scale.

Statistical Analysis

The demographic variables and clinical data of the patients were expressed as numbers and percentages or means and standard deviation for categorical and continuous variables respectively and these values are presented in Table 1. Internal consistency was analyzed by Cronbach's alpha coefficient for total and subscores of the GQL-15 scale. Cronbach's alpha values between 0.70 or greater were acceptable and between 0.60 and 0.70 are regarded as borderline[14]. Test-retest reliability was assessed with computation of intraclass correlation coefficient (ICC) with 95% confidence interval (CI) values and accepted as poor (below 0.5), moderate (0.5–0.75), good (0.75–0.9), or excellent (> 0.90)[18].

The floor and ceiling effect were analyzed by calculating the percentages of the answers of the lowest and highest scores for each subtitle. Over 15% rates for the highest and lowest scores showed ceiling and floor effects, respectively[14]. We have analyzed the possible correlations between the GQL-15 total and all subscale scores and NEI-VFQ-25 questionnaire subscale scores to examine the construct validity. We have hypothesized that subscales of the GQL-15 questionnaire would be negatively correlated with some subscales of the NEI-VFQ-25 questionnaire and Spearman's correlation coefficients were calculated. Spearman correlation coefficients were classified as below 0.40 weak, between 0.40 and 0.69 moderate and above 0.70 as high[19].

We used exploratory factor analysis (EFA) method with varimax rotation to evaluate construct validity. Statistical analyses were performed using SPSS 25.0 (IBM Corp, Armonk, NY, USA). P-value below 0.05 was considered statistically significant.

Results

We have evaluated 185 patients, 42 participants were not included due to the eligibility criteria and 17 patients were excluded due to insufficient data. Finally, our study sample consisted of 126 patients. Demographic variables and clinical data are presented in Table 1. The mean age was 61.71 (SD 12.56) years and the mean disease duration was 7.94 (SD 4.79) years.

Table 1. Baseline characteristics

Variable	Sample (n=126)
Age (years); mean (SD)	61.71±12.56
Sex; n(%)	
Male	66 (52.4)
Female	60 (47.6)
Marital status; n(%)	
Single	99 (78.6)
Married	27 (21.4)
Education; n(%)	
<High school	78 (61.9)
=High school	26 (20.6)
>High school	22 (17.5)
Living situation; n(%)	
Alone	13 (10.3)
Not alone	113 (89.7)
Employment status; n(%)	
On a job	12 (9.5)
Retired	64 (50.8)
No job	50 (39.7)
Current smoker; n(%)	16 (12.7)
Comorbidities; n(%)	
Diabetes	13 (10.3)
Hypertension	26 (20.6)
Diabetes and hypertension	24 (19.0)
Other	4 (3.2)
Antiglaucoma medication usage; n(%)	86 (68.3)
Time since glaucoma diagnosis (years); mean (SD)	7.94±4.79

GQL-15 scale was successfully translated into Turkish without any major changes for cultural adaptation. All items were suitable for the Turkish population, any patients reported major issues regarding the questionnaire.

Reliability

We calculated Cronbach's alpha coefficient of the Turkish version of the GQL-15 scale. Cronbach's alpha coefficient for the total scale was 0.95 which indicated optimal internal consistency. Cronbach's alpha values for subscales were between 0.65 and 0.89; this value was not calculated for the outdoor mobility subscale, because it consists of one item. Interclass correlation coefficient values for test-retest reliability of the total score and all subscales were good to excellent ranged between (0.85 and 0.95) (Table 2).

Validity

A ceiling effect was not found in total score and subscale scores; however, floor effect was found for central and near

Table 2. Reliability of the GQL-15 scale

Domain	Score (Mean±SD)	Cronbach's alpha	Intraclass correlation coefficients (95% CI)	Floor effect (%)	Ceiling effect (%)
GQL-15 total	29.39±12.79	0.95	0.95 (0.93–0.97)	12.69	4.76
Central and near vision	38.96±17.83	0.65	0.85 (0.77–0.91)	32.53	3.17
Peripheral vision	38.06±19.64	0.93	0.92 (0.88–0.95)	25.39	3.96
Glare and dark adaptation	40.95±16.72	0.89	0.89 (0.83–0.93)	20.63	4.76
Outdoor mobility	33.93±20.90	NA	0.93 (0.89–0.95)	NA	NA

vision, peripheral vision, and glare and dark adaptation subscales as 32.53%, 25.39%, and 20.63%, respectively. Kaiser–Meyer–Olkin test value was 0.910 and Bartlett's test of sphericity was $p<0.001$ and these results showed that the data of the study was adequate for factorial analysis. Based on Eigenvalue above one, two factors were extracted from EFA results which explained 72.67% of the total variance (62.89% and 9.77% for Factor 1 and Factor 2, respectively). Factor 1 contained seven questions (q1, q2, q3, q4, q5, q6, and q7) and Factor 2 contained seven questions (q8, q9, q10, q11, q12, q13, q14, and q15). Table 3 shows EFA results for the Turkish version of the GQL-15 scale. Factor 1 is included 1 item (q15) from central and near vision subscale, 1 item (q10) from the outdoor mobility scale, and 1 item (q14) from the peripheral vision subscale. Factor 2 included 1 item (q1) from the central and near vision subscale and 1 item (q4) from glare and dark adaptation subscale. The items displayed an adequate communality index of >0.4. According to the Spearman correlation analysis results of the Turkish version of the GQL-15 scale total score and subscale scores and NEI-VFQ-25 subscales except driving, we found significant negative correlations among the tested variables (Table 4). We did not analyze the driving subscale of the NEI-VFQ-25, because only 30 of our 126 patients (23.80%) reported their driving status.

Table 3. Exploratory factor analysis of Turkish version of GQL-15 scale

GQL-15 items		Factor 1	Factor 2
1.	Tripping over objects	0.702	0.464
2.	Seeing objects coming from the side	0.792	0.330
3.	Crossing the road	0.872	0.321
4.	Walking on steps/stairs	0.811	0.358
5.	Bumping into objects	0.805	0.394
6.	Judging distance of foot to step/curb	0.872	0.283
7.	Finding dropped objects	0.845	0.262
8.	Recognizing faces	0.740	0.386
9.	Reading newspaper	0.305	0.702
10.	Walking after dark	0.335	0.815
11.	Seeing at night	0.381	0.767
12.	Walking on uneven ground	0.520	0.658
13.	Adjusting to bright lights	0.243	0.790
14.	Adjusting to dim lights	0.267	0.772
15.	Going from light to dark or vice versa	0.287	0.674

Discussion

In this study, we aimed to translate and culturally adapt the GQL-15 scale into the Turkish language and perform reliability and validity analysis of the scale. The Turkish version of the GQL-15 scale showed acceptable reliability and validity, this scale can be used to measure the level of the quality of life of Turkish population with glaucoma.

In the present study, there was no lack of response to the scale. Missing data were not observed. This situation may be the result of applying questionnaires through face-to-face interviews.

The mean GQL-15 total score of the Turkish population was 29.63±13.31. We did not investigate the glaucoma severity of our patients; however, when we compare our GQL-15 total mean score with the Chinese version, the glaucoma severity according to visual field loss of our population may be regarded as moderate[8].

Our reliability analysis results evaluated by computing Cronbach's alpha value for GQL-15 total score was 0.95, which is similar to previously reported Chinese as 0.96,[12] Serbian as 0.89,[11] and original versions as 0.95[9] Concerning the subscale reliability, central and near vision subscale displayed Cronbach's alpha value as 0.65 which can be regarded as nearly satisfactory and this value reported as 0.74, 0.75, and 0.24 for Persian, Chinese, and Serbian versions, respectively[11-13]. In our study, Cronbach's alpha coefficient for central and near vision subscale was lower than the optimal range which is between 0.70 and 0.99. This result can be explained by the fact that the central and near vision subscale consists of only two items and the low number of items in the subscale can also reduce the Cronbach alpha coefficient. The other two subscales (peripheral vision and glare and dark adaptation) demonstrated

Table 4. Spearman correlation coefficients of GQL-15 subscales and total score with NEI-VFQ-25 subscales

Parameters	GQL-15 total score	GQL-15 central/ near vision	GQL-15 peripheral vision	GQL-15 glare/ dark adaptation	GQL-15 outdoor mobility
General health	−0.295	−0.331	−0.296	−0.224	−0.284
General vision	−0.593	−0.585	−0.513	−0.592	−0.447
Ocular pain	−0.421	−0.468	−0.364	−0.404	−0.347
Near vision	−0.662	−0.668	−0.612	−0.595	−0.577
Distant vision	−0.745	−0.615	−0.725	−0.683	−0.607
Social functioning	−0.581	−0.523	−0.564	−0.494	−0.583
Mental health	−0.637	−0.607	−0.576	−0.597	−0.544
Role limitation	−0.348	−0.346	−0.313	−0.365	−0.299
Dependency	−0.575	−0.576	−0.559	−0.503	−0.585
Color vision	−0.454	−0.490	−0.453	−0.382	−0.465
Peripheral vision	−0.646	−0.629	−0.651	−0.544	−0.650
Patient Characteristics					
Sex	−0.017	−0.005	0.045	−0.060	−0.030
Age	0.154	0.116	0.237	0.073	0.190
Education	−0.118	−0.193	−0.051	−0.090	−0.114
Living situation	−0.027	−0.019	−0.042	−0.048	−0.033
Employment status	0.091	0.153	0.153	0.025	0.053
Antiglaucoma medication usage	0.007	0.061	−0.001	0.016	−0.013
Time since glaucoma diagnosis	0.016	0.009	0.09	0.017	0.021
Comorbidities	0.205	0.199	0.210	0.184	0.181

Bold means $p<0.05$.

excellent reliability and Cronbach's alpha value of outdoor mobility subscale have not been calculated, because this subscale includes only one item.

Our study ICC values were between 0.85 and 0.95 (CI 95% 0.77–0.97) which confirms excellent test-retest reliability which is similar or better than the previous reports[11,12]. No ceiling effect was noted for the overall score and subscale scores; however, floor effect was found for central and near vision, peripheral vision, and glare and dark adaptation subscale scores. In contrast with our study, Zhou et al.[12] detected no floor but ceiling effect for all subscales. This result may limit the sensitivity of the Turkish version of the GQL-15 scale to detect the worsening of QoL. The reason for this result may have occurred due to our patients' glaucoma severity degree. Further studies should be designed to confirm our results with more sample size.

The results of our explanatory factor analysis did not confirm the original factor number and item distribution of the original version[9]. Other versions factor analysis also were not fully confirmed the original four domains or item distribution. Chinese and Serbian version analysis resulted in four factors, but item distribution was different than the original version. Their sample included both POAG and other glaucoma subtypes[11,12]. However, the Persian version displayed two factors, but the item distribution was not similar to our item distribution[13]. Based on the EFA factor analysis results, our two major factors can be suggested as peripheral vision and glare and dark adaptation subscales. The reason for our factor analysis result can be due to the patient population profile or cultural differences with our populations.

The present study investigated the association between the GQL-15 and NEI-VFQ-25 scale or demographic and disease characteristics. General vision, peripheral vision, near vision, and distant vision subscales of the NEI-VFQ-25 are strongly or nearly strongly correlated with GQL-15 total score and subscale scores which may indicate that GQL-15 scale is more related with visual impairment status and this scale can be used to complement the clinical assessments of visual functioning. Demographic variables were not correlated with the GQL-15 total score or subscale scores, whereas comorbidities such as diabetes mellitus and hypertension were related. Our correlation coefficients between the NEI-VFQ-25 and the Turkish version of the GQL-15 scale domains were similar to other studies[20,21].

It has been reported that detecting the level of quality

of life has potential benefits for reducing disease-related economic burden, evaluating the progress of the disease, and assessing the subjective and objective functions of these patients[1,22]. GQL-15 questionnaire is shorter than NEI-VFQ-25 and faster to administer during clinical practice[10,21]. Hence, we believe that the results of our study may lead to an increase in the management of glaucoma disease in the Turkish population.

This study is not without limitations. First, we did not collect glaucoma severity and visual impairment data. Future studies that will be planned with the Turkish population investigating the quality of life of patients with glaucoma should stratify the patients according to their glaucoma severity and years with glaucoma. Second, we have planned the present study in a single center that this situation may limit the representation of the whole Turkish population. Thirdly, we did not use generic quality of life instruments (e.g., Short-Form 36), which may limit our validity analysis. Finally, we did not perform responsiveness analysis, because our patients generally diagnosed with glaucoma several years ago and they usually take anti-glaucoma medicine during the study period. Future studies, with a longitudinal design, should be planned starting from the beginning of the glaucoma disease and follow the patients and investigating the effect of disease on quality of life.

Conclusion

Our findings suggest that the Turkish version of the GQL-15 scale could be a reliable and valid measurement method to understand the impact of glaucoma on quality of life in clinical practice. This scale can be used in future studies to assess the quality of life in patients with primary open-angle or other types of glaucoma.

Ethics Committee Approval: This study was approved by the Research Ethics Committee (ATADEK 2019-7/2) and registered as a clinical trial (Clinicaltrials.gov NCT03967145).

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