

# Quality of Life After Ocular Trauma: A Prospective, Longitudinal, Questionnaire- Based Study in a Tertiary Hospital in the Philippines

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## ABSTRACT

**Purpose:** To determine the health-related quality of life of patients sustaining ocular injuries prognosticated to be visually disabling and to correlate baseline characteristics with quality of life indices.

**Methods:** A prospective, questionnaire-based health-related quality of life study was conducted in a tertiary hospital in the Philippines among 33 patients prognosticated to have visually-disabling ocular injuries using the ocular trauma score (OTS). Clinical and demographic data were collected and quality of life indices were measured using the EuroQoL five-dimension five-level (EQ-5D-5L) questionnaire at baseline and on three subsequent follow-up visits. Data was analyzed by OTS and type of injury. Baseline characteristics were described and correlated with quality of life indices.

**Results:** Of the 33 participants recruited at baseline, 26 were able to return to at least 1 of the 3 recommended follow-up visits. The median age of study participants upon admission was 35 years old with 31 (94%) being males.

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The patients were admitted at a median of 4 days from injury. Thirty-one (31) or 94% of the participants sustained open globe injuries, with 14 (42%) being penetrating lacerations and 10 (30%) classified as having intraocular foreign bodies. Most patients reported pain and discomfort (82%), problems in usual activities (70%), and anxiety and depression (70%) at baseline. Those with an OTS of 1 had lower median EQ index score (0.447) and EQ visual analog scale (VAS) score (56). A diagnosis of globe rupture was associated with lower median EQ index scores (0.448) and EQ VAS scores (56). EQ index and VAS scores were lowest at baseline. A statistically significant increase in EQ VAS was seen from baseline to the first month of follow-up ( $p=0.01$ ). Using univariate regression analysis, no statistically significant correlation between baseline characteristics and baseline quality of life indices was identified.

**Conclusion:** Health-related quality of life was lowest shortly after admission for management of ocular trauma and significantly improved at 1 month. Most patients reported pain and discomfort, problems in usual activities, and anxiety and depression. None of the clinical characteristics were shown to be significantly associated with quality of life indices, including visual acuity.

**Keywords:** Ocular trauma, ocular injury, eye injury, health-related quality of life, quality of life, disability

Ocular trauma remains to be an important cause of low vision and blindness leading to handicap and disability. An estimated 2.4 million eye injuries occur annually, potentially leading to permanent visual impairment and disability.<sup>1</sup> In 1998, around 3.9 million people were reported to have either low vision or blindness bilaterally, and 19 million more having low vision or blindness in one eye due to ocular trauma.<sup>2</sup>

The impact of ocular trauma is widely described in literature in terms of its clinical characteristics, visual outcome, and prognostic factors.<sup>1,3-9</sup> Its effect on quality of life (QOL), however, has been limited to a few studies. QOL is defined as a broad multidimensional concept that usually includes subjective evaluations of both positive and negative aspects of life which include health, culture, and values, among others.<sup>10</sup> Health-related quality of life (HRQoL) is how an individual perceives his/her physical and mental health, and encompasses aspects such as functional status, social support, and socioeconomic status. Self-rated health is a predictor of both morbidity and mortality, suggesting that the determination of QOL is important in cases of eye injuries.<sup>11,12</sup>

The Ocular Trauma Score (OTS) is a scoring system developed to predict visual outcomes of patients after open globe ocular trauma at 6 months after injury.<sup>6</sup> It is calculated based on the visual acuity and presence of various clinical characteristics upon initial examination. The probability of having a final visual acuity of 20/50 or worse at six months for

patients with ocular trauma scores of 1, 2, and 3 was determined to be at 99%, 85%, and 59%, respectively.<sup>6</sup> A positive correlation between OTS score and final visual acuity has been achieved in studies testing its applicability in different settings, including the Philippines.<sup>5-9</sup>

In 2007, the group of Van Beeck *et al.* developed a common core of health status measures by which disabilities from different types of injuries are assessed and reported.<sup>13</sup> The combination of 2 tools, Health Utilities Index Mark III (HUI3) and the three-level EuroQol-5D (EQ-5D-3L), was recommended for use in all injury-related disability studies over all other tools evaluated. However, the absence of previous studies and validation of the HUI3 in the Philippine setting led us to use only the updated version of the EQ-5D-3L questionnaire, the EQ-5D-5L.

The EuroQol five-dimensional five-level (EQ-5D-5L) questionnaire addresses 5 dimensions of daily living, namely: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.<sup>14</sup> The responses of the patient for each dimension are recorded in 5 levels of severity: no problems (Level 1), slight problems (Level 2), moderate problems (Level 3), severe problems (Level 4), and extreme problems (Level 5). The EQ-5D-5L has been validated in a diverse patient population in 6 countries, including 8 patient groups with chronic conditions and a student cohort.<sup>15</sup> The Tagalog translation of its earlier version, the EQ-5D-3L, has been validated for use in the Philippine setting.<sup>16</sup> In a systematic review comparing the 2 versions of the questionnaire, the

EQ-5D-5L was found to be better than the former version.<sup>17</sup> Advantages of the use of the EQ-5D-5L questionnaire over similar QOL tools include a more accurate estimation of more severe injuries and a more valid utility scoring system.<sup>18</sup>

Current available literature described QOL measures in subsets of ocular trauma patients, mostly among open globe injuries.<sup>19-21</sup> In all of these studies, QOL was measured months to years after the injury. To the best of our knowledge, an attempt to describe QOL trends prospectively among patients has not yet been made previously.

Our purpose was to determine the HRQoL of patients sustaining potentially visually-disabling ocular injuries. We aimed to compare the QOL of patients with different types of ocular injuries and OTS over 4 months after injury. By correlating clinical and diagnostic characteristics with QOL indices, we hoped to identify patient-related factors that potentially impact the QOL of ocular trauma patients to guide clinicians in the holistic management of their patients.

## METHODS

The study is a prospective, longitudinal questionnaire-based HRQoL study done in the Philippine General Hospital, Manila, Philippines. Institutional review board approval was obtained. Written informed consent was secured from the study participants. Patients sustaining ocular injuries admitted at the ophthalmology ward from December 1, 2017 to August 1, 2018 were screened for inclusion to the study.

Patients aged 18 years old and above who were able to speak in conversant Filipino and was recently diagnosed with ocular trauma with OTS 1 to 3 were included in the study. Exclusion criteria were previous diagnosis of other ophthalmologic conditions, a positive history of previous surgery on affected eye, and decreased sensorium.

Collection of baseline data was done within 48 hours upon admission at the ophthalmology ward. These included age, sex, civil status, educational attainment, employment status, monthly income, membership in social services, presenting visual acuity, type of injury, and ocular trauma score. The Tagalog translation of the EuroQol five-dimensional

five-level (EQ-5D-5L) questionnaire was administered by the primary investigator via face-to-face interview during the same encounter.<sup>22</sup> Classification of injury was done according to the Birmingham Eye Trauma Terminology (BETT) System.<sup>23</sup>

Study participants were advised 3 follow-up visits on the 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> month after recruitment wherein clinical and demographic data were collected and the EQ-5D-5L questionnaire readministered. The clinical course and changes from baseline were noted.

The primary outcome of the study was self-rated QOL measured by the EQ-5D-5L tool. Results were reported as an EQ-5D-5L *index value* to describe overall health profile and EQ *visual analog scale* (EQ VAS) as a measure of overall self-rated health status. Value sets for Thailand were used in computation of the EQ index.<sup>18</sup> The highest possible score is a report of “no problems” for all dimensions and equivalent to an index score of 1.000, while the lowest possible score is a report of “extreme problems” in all dimensions and is equivalent to -0.452. Secondary outcomes included correlation of baseline characteristics to QOL indices at baseline.

## Statistical Analysis

The software used for statistical analysis was STATE/SE 14.1 (StataCorp, Lakeway Drive, College Station, Texas, USA). Descriptive statistics including frequencies, percentages, means, medians, and standard deviations were used to summarize the demographic and clinical characteristics of the patients. Kruskal-Wallis test was used to compare baseline QOL indices across trauma scores and types of injury. Univariate regression analysis was done to correlate baseline characteristics with QOL indices. QOL indices were compared across different visits using the Mann-Whitney U test. Spearman correlation was used to determine the relationship between visual acuity and QOL indices at 4 different hospital visits. For all inferential analyses, a *p*-value of less than 0.05 was considered significant.

## RESULTS

### Baseline Characteristics

Study participants included 33 patients admitted at the ophthalmology ward for various forms of ocular trauma. Baseline characteristics are summarized

in Table 1. The median age of study participants on admission was 35 years old (range: 19-59 years old). Thirty-one (31) out of 33 (93.9%) participants were males. The patients were admitted at a median of 4 days from injury. Thirty-one (31 or 93.9%) participants sustained open globe injuries, with 14 (42%) being penetrating lacerations and 10 (30%) classified as having intraocular foreign bodies (IOFB). Study participants were equally distributed by OTS with 11 each being classified among OTS 1, OTS 2, and OTS 3. Most patients (57.6%) presented with a visual acuity of light perception or hand motion. The most common clinical characteristic identified was a relative afferent pupillary defect (63.6%).

**Table 1.** Baseline Characteristics

Median age at injury (in years)	35
Range	19 – 59
Male sex, n (%)	31 (93.9%)
Employed at time of injury, n (%)	29 (87.9%)
Median monthly income (in Philippine Peso)	9800
Range	0 – 16,000
Median days from injury to recruitment	4
Range	2 – 28
Type of injury, n (%)	
Closed globe	
Contusion	2 (6%)
Lamellar laceration	0 (0%)
Open globe	
Penetrating laceration	14 (42%)
Intraocular foreign body	10 (30%)
Perforating laceration	0 (0%)
Rupture	7 (21%)
Ocular Trauma Score, n (%)	
OTS 1	11 (33%)
OTS 2	11 (33%)
OTS 3	11 (33%)
Initial visual acuity, n (%)	
NLP	8 (24.2%)
LP/HM	19 (57.6%)
1/200 – 19/200	4 (12.1%)
20/200 – 20/50	2 (6.1%)
≥20/40	0
Clinical findings, n (%)	
Rupture	7 (21.2%)
Endophthalmitis	4 (12.1%)
Perforating injury	0
Retinal detachment	4 (12.1%)
Relative afferent pupillary defect	21 (63.6%)
Median EQ Index Score	0.476
Range	-0.082 – 1.000
Median EQ VAS Score	60
Range	0 – 100
Mean EQ Index Score (± SD)	0.494 (±0.264)
Mean EQ VAS Score (± SD)	60.879 (±25.710)

IOFB = intraocular foreign body, LP/HM = light perception or hand movement, NLP = no light perception, VAS = visual analog scale, SD = standard deviation

## Follow-up Rate

Thirteen patients (13 or 39%) returned for the recommended first follow-up visit (1 month from baseline), 17 (51%) returned for the second visit (2 months from baseline) while 15 (45%) returned for the third visit (4 months from baseline). The median length from baseline of the follow-up visits were 30 days, 63 days, and 130 days, respectively.

## Quality of Life

Baseline median EQ index score among all patients was 0.476 (range -0.082 to 1.000) and baseline median EQ VAS score was 60 (range 0 to 100). Those with an OTS of 1 had lower EQ index score (median 0.447, range -0.082 to 0.060) and EQ VAS score (median 56, range 0 to 90) (Table 2). Globe rupture was associated with the lowest median EQ VAS score (56, range 0 to 90) compared to other types of injury, while presence of an IOFB was associated with the lowest median EQ index score (0.442, range 0.040 to 0.780,  $p=0.4358$ ) (Table 3). Patients with globe contusions (EQ index 0.523,  $p=0.4358$ ; EQ VAS 73,  $p=0.8821$ ) and penetrating lacerations (EQ index 0.651,  $p=0.4358$ ; and EQ VAS 61,  $p=0.8821$ ) had higher self-rated health status than the median value across all participants, while those having globe ruptures (EQ index 0.448,  $p=0.4358$ ; and EQ VAS 56,  $p=0.8821$ ) and IOFB (EQ index 0.442,  $p=0.4358$ ; and EQ VAS 61.5,  $p=0.8821$ ) have lower values (Table 3). However, none of these findings were statistically significant (EQ index  $p=0.4358$ , EQ VAS  $p=0.8821$ ) (Table 3).

**Table 2.** Baseline median EQ index and EQ VAS by ocular trauma score

	OTS 1	OTS 2	OTS 3	<i>p</i> -value
EQ Index	0.447	0.708	0.547	0.5130
EQ VAS	56	62	60	0.8029

**Table 3.** Baseline median EQ index and EQ VAS by type of injury

	Contusion	Penetrating	IOFB	Globe rupture	<i>p</i> -value
EQ Index	0.523	0.651	0.442	0.448	0.4358
EQ VAS	73	61	61.5	56	0.8821

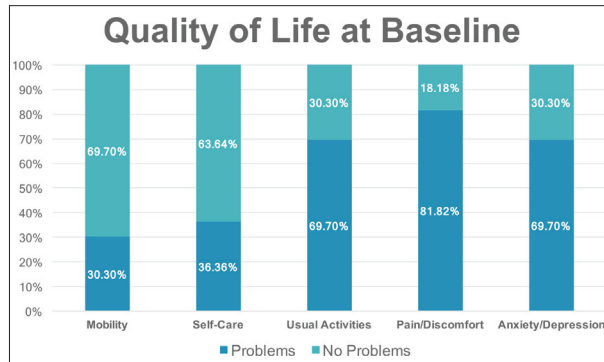


Figure 1. Descriptive quality of life at baseline according to the EQ dimensions

Descriptive QOL among all patients at presentation is shown in Figure 1. More than half of patients consistently reported problems in three dimensions: usual activities (69.70%), pain and discomfort (81.82%), and anxiety and depression (69.70%). More patients with an OTS of 1 reported having problems in usual activities and having anxiety and depression (81.82%), while pain and discomfort were reported equally across trauma scores (81.82%) (Table 4). A larger percentage of patients with globe rupture reported having anxiety and depression (85.71%) than any other type of injury, while a larger percentage of patients with IOFB reported problems in performing usual activities (80%) (Table 5).

Table 4. Frequency of reported problems at baseline across ocular trauma scores

EQ 5D Dimension		OTS 1 n=11	OTS 2 n=11	OTS 3 n=11	TOTAL n=33
Mobility	No problems	8 (72.73%)	9 (81.82%)	6 (54.55%)	23 (69.70%)
	With problems	3 (27.27%)	2 (18.18%)	5 (45.45%)	10 (30.30%)
Self-care	No problems	5 (45.45%)	9 (81.82%)	7 (63.64%)	21 (63.64%)
	With problems	6 (54.55%)	2 (18.18%)	4 (36.36%)	12 (36.36%)
Usual activity	No problems	2 (18.18%)	5 (45.45%)	3 (27.27%)	10 (30.30%)
	With problems	9 (81.82%)	6 (54.55%)	8 (72.73%)	23 (69.70%)
Pain/Discomfort	No problems	2 (18.18%)	2 (18.18%)	2 (18.18%)	6 (18.18%)
	With problems	9 (81.82%)	9 (81.82%)	9 (81.82%)	27 (81.82%)
Anxiety/Depression	No problems	2 (18.18%)	5 (45.45%)	3 (27.27%)	10 (30.30%)
	With problems	9 (81.82%)	6 (54.55%)	8 (72.73%)	23 (69.70%)

Table 5. Frequency of reported problems at baseline across types of injury

EQ 5D Dimension		Con-tusion (n=2)	Penetrating (n=14)	IOFB (n=10)	Globe rupture (n=7)	TOTAL
Mobility	No problems	2 (100%)	10 (71.43%)	6 (60%)	5 (71.43%)	23 (69.70%)
	With problems	0 (0%)	4 (28.57%)	4 (40%)	2 (28.57%)	10 (30.30%)
Self-care	No problems	2 (100%)	11 (78.57%)	5 (50%)	3 (42.86%)	21 (63.64%)
	With problems	0 (0%)	3 (21.33%)	5 (50%)	4 (57.14%)	12 (36.36%)
Usual activity	No problems	2 (100%)	6 (42.86%)	2 (20%)	2 (28.57%)	10 (30.30%)
	With problems	0 (0%)	8 (57.14%)	8 (80%)	5 (71.43%)	23 (69.70%)
Pain/Discomfort	No problems	0 (0%)	3 (21.43%)	0 (0%)	2 (28.57%)	6 (18.18%)
	With problems	2 (100%)	11 (78.57%)	10 (100%)	5 (71.43%)	27 (81.82%)
Anxiety/Depression	No problems	1 (50%)	5 (35.71%)	3 (30%)	1 (14.29%)	10 (30.30%)
	With problems	1 (50%)	9 (64.29%)	7 (70%)	6 (85.71%)	23 (69.70%)

IOFB = intraocular foreign body

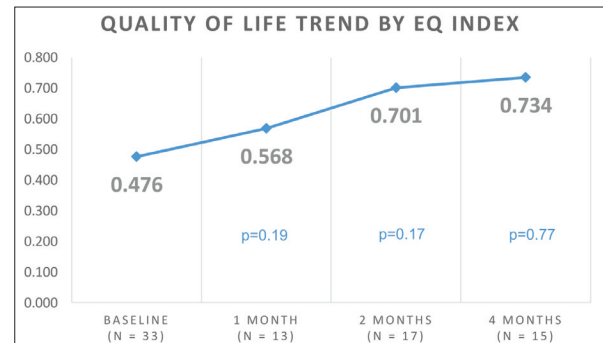


Figure 2. Quality of life trend by EQ index from baseline to four months. Medians were compared using Mann-Whitney U test.

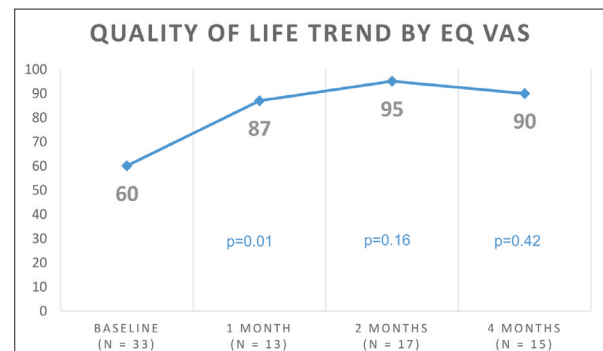


Figure 3. Quality of life trend by EQ VAS from baseline to four months. Medians were compared using Mann-Whitney U test.

EQ index scores (Figure 2) and VAS (Figure 3) were lowest upon initial presentation. A statistically

significant increase in EQ VAS ( $p=0.01$ ) was seen between baseline measurement and the first month follow-up visit. An increasing trend was noted in EQ index scores in subsequent follow-up visits (Figure 2).

**Table 6.** Univariate linear regression analysis of patient characteristics and EQ index at baseline

Variables	EQ Index		EQ VAS	
	Beta coefficient	p-value	Beta coefficient	p-value
Age	0.004	0.218	0.23	0.559
Sex				
Male	0.22	0.252	-9.71	0.613
Female*				
Civil status				
Single*				
Married	-0.003	0.980	-0.68	0.953
Widowed	0.22	0.430	36.07	0.193
Common law marriage	-0.11	0.354	0.07	0.995
Educational attainment				
Elementary*				
High school	-0.15	0.134	-1.40	0.891
College/vocational	-0.22	0.110	2.14	0.876
Type of ocular trauma				
Contusion*				
Penetrating laceration	0.07	0.736	-7.79	0.698
IOFB	-0.09	0.653	-15.1	0.465
Globe rupture	-0.14	0.503	-20.0	0.351
Initial visual acuity				
NLP*				
LP/HM	0.17	0.135	11.82	0.296
1/200-19/200	0.08	0.625	1.88	0.908
20/200-20/50	0.30	0.162	11.88	0.573
Globe rupture	-0.14	0.209	-10.0	0.369
Endophthalmitis	0.09	0.551	8.67	0.536
Retinal detachment	-0.05	0.744	-7.83	0.576
Relative afferent pupillary defect	0.03	0.789	-4.77	0.616
Ocular trauma score				
1*				
2	0.12	0.297	8.91	0.433
3	0.10	0.385	3.27	0.772

\* Comparison group

IOFB = intraocular foreign body, LP/HM = light perception or hand movement, NLP = no light perception, VAS = visual analog scale

**Table 7.** Summary of LogMAR, EQ index and EQ VAS

Visit	LogMAR	EQ index	EQ VAS
	Median Mean ( $\pm$ SD) n	Median Mean ( $\pm$ SD) n	Median Mean ( $\pm$ SD) n
Baseline	2.3 2.331 (0.625) 33	0.476 0.494 (0.264) 33	60 60.879 (25.710) 33
1 month	2.1 1.987 (1.067) 14	0.568 0.624 (0.186) 14	87 79.286 (26.016) 14
2 months	2.7 1.976 (1.219) 17	0.701 0.701 (0.227) 17	95 85.00 (25.017) 17
4 months	2.5 1.866 (1.277) 14*	0.734 0.704 (0.235) 15	90 81.733 (23.965) 15

\*Visual acuity was not recorded in one patient

**Table 8.** Correlation of LogMAR with EQ index and EQ VAS

Time of visit (observation pairs)	Factors for correlation	Spearman's rank correlation coefficient	p-value
Baseline (n=33)	LogMAR (VA) and EQ index	-0.1934	0.2808
1 month (n=14)	LogMAR (VA) and EQ VAS	-0.1617	0.3686
	LogMAR (VA) and EQ index	-0.3368	0.2389
2 months (n=17)	LogMAR (VA) and EQ VAS	-0.0340	0.9081
	LogMAR (VA) and EQ index	0.0503	0.8479
4 months (n=14)	LogMAR (VA) and EQ VAS	0.0249	0.9244
	LogMAR (VA) and EQ index	-0.2112	0.4685
	LogMAR (VA) and EQ VAS	-0.2724	0.3461

Using univariate linear regression analysis comparing baseline patient characteristics with EQ index and EQ VAS, none of the baseline characteristics were found to have significant predictive value of QOL indices (Table 6). A summary of visual acuity scores and QOL indices are presented in Table 7. Using Spearman's rank correlation coefficient to compare EQ index scores and EQ VAS scores with visual acuity (in LogMAR) in all four clinic visits, no statistically significant association was identified (Table 8).

## DISCUSSION

Patient demographics in this study are similar to other studies on ocular trauma. Young adult males make up majority of our study population. The proposed explanation consistently given for this observation was that majority of eye trauma occurs in the workplace particularly in the construction industry, in which young adult males comprise most of the workforce.<sup>3-4,24-27</sup> In our study, 94% of patients were classified to have open globe injuries. There were only 2 patients with closed globe injuries: 1 with traumatic optic neuropathy and 1 with both ruptured lens and retinal detachment. Two studies on ocular trauma in Singapore<sup>24-25</sup> reported the prevalence of open globe injuries to be less than 5% only, a number that is much less than that identified in our study. We attribute this observation to the use of the ocular trauma scores and admission to the hospital ward as inclusion criteria which, in effect, selected patients who had poor visual prognoses. The diagnosis of open globe injury itself is an indicator of poor visual outcome.<sup>26</sup> The results of the study will, therefore, be more applicable to patients with open globe injuries despite our attempt to also represent the closed globe type of injury in our study population. The presence of poor visual acuity and relative afferent pupillary defect at baseline in more than half of all patients was expected, as both these factors were reported to be indicators of poor visual outcome.<sup>3-4,8-9,27</sup>

To the best of our knowledge, this is the first study to describe QOL of eye trauma patients shortly after the injury. In our study, we were able to identify that majority of patients with varying trauma scores and types of injury presented with pain and discomfort, problems in usual activities, and anxiety and depression. Adequate pain control, psychosocial evaluation and occupational rehabilitation are, therefore, suggested to be included in the management of eye trauma patients to address these problems.

Comparing the QOL indices across different trauma scores, differences recorded failed to show statistical significance, suggesting that QOL may not differ significantly among patients with OTS of 1 to 3. The result may, however, be different among patients sustaining injuries with better visual prognosis, which warrants further investigation. The trend identified across types of injuries by EQ index was different from that by EQ VAS, and neither showed any statistically significant difference. This suggests that QOL across different types of injury may be comparable.

This study showed that the HRQoL improved over time following injury. The increase in QOL indices was greatest between initial presentation and the first month after injury, where it was found to be statistically significant. Possible reasons for this observation may be the alleviation of pain and perceived acute illness, adjustment to injury outcome and prognosis, and a positive result of treatment.

The results of this study add to our knowledge from previously published literature. Rofail *et al.* reported that patients sustaining open globe injuries have difficulties in reading, doing their favorite hobbies and performing their usual jobs as far as 12 years from injury.<sup>19</sup> In our study, we have found that these problems in usual activities are already reported upon presentation. Yuksel *et al.* reported that all HRQoL aspects were decreased compared to control among patients sustaining ocular penetrating injuries at a mean of 8 months after injury.<sup>20</sup> This suggests that despite an improving trend found in our study, QOL may not return to pre-morbid levels.

None of the baseline patient characteristics including age, sex, educational attainment, type of trauma, nor ocular trauma score were significantly associated with baseline QOL indices. This suggests that none of the clinical and demographic characteristics of eye trauma patients will be able to help predict or estimate their QOL upon initial consult with their physicians. In the Blue Mountains Eye Study involving 3,108 study participants in a general population, moderate to severe visual impairment was associated with poorer HRQoL.<sup>28</sup> We sought a similar association between visual acuity and QOL indices in our study by using Spearman's rank order correlation analysis comparing these across all four hospital visits but our results showed no statistically significant correlation between the two factors. Our results were more consistent with those of Yuksel *et al.* which did not report any correlation between visual acuity and health-related quality of life.<sup>20</sup> The discrepancy between our results and that of the Blue Mountains Eye Study is likely attributable to the difference in study population.<sup>28</sup> HRQoL may be correlated with visual acuity in the general population but not among ocular trauma patients. Clinicians should, therefore, be wary of estimating the QOL of eye trauma patients by their visual acuity.

The limitations of the study should be taken into account in interpreting our results. Patients who are admitted to the hospital ward belong to the

low socioeconomic classes which may restrict the relevance of our results to similar subsets of the general population only. The use of the OTS as an inclusion criterion led to selection of mostly subjects with open-globe injuries. Our results, therefore, may not apply to other types of injuries that were not well represented in our study population (i.e. closed globe injuries and perforating lacerations). Recruitment of patients from the hospital ward instead of the emergency department also resulted to exclusion of most closed globe injuries which did not usually warrant ward admission. These factors also resulted into a small sample size. Poor adherence to the recommended follow-up schedule led to an even smaller data for analysis in subsequent visits. The short duration of the study did not allow for a description of the chronic phase of injury to compare directly with previously published results.

## Recommendations

One advantage of using the EQ-5D-5L questionnaire is its utility in public health as the EQ index scores can be used in calculation of quality-adjusted life years (QALYs) for economic evaluation of health care. The data derived in our study may be used in future studies which aim to determine the economic aspects of eye injuries.

To address the limitations enumerated, we recommend that future studies expand the population and the study duration. If the ocular trauma scoring system will still be used to determine inclusion into the study, we expect that analyzing trauma with OTS of 4 and 5 will largely increase both the number of study participants and the representation of closed globe injuries. Likewise, a separate study on the quality of life of patients sustaining closed globe injuries may also be pursued.

## CONCLUSION

In this study, we found that most patients sustaining potentially visually-disabling ocular injuries report pain and discomfort, problems in performing usual activities, and anxiety and depression upon initial presentation. There was no significant difference in health-related QOL indices identified across ocular trauma scores and types of injury. Across hospital visits, health-related QOL is at its lowest immediately after injury and improves significantly in the first month. None of the clinical characteristics at baseline

were shown to predict quality of life indices. Visual acuity was also not found to be significantly correlated with QOL indices in any of the four hospital visits.

## REFERENCES

1. Kuhn F, Morris R, Witherspoon CD, Mann L. Epidemiology of blinding trauma in the United States Eye Injury Registry. *Ophthalmic Epidemiol*. 2006;13(3):209-16.
2. Negrel AD, Thylefors B. The global impact of eye injuries. *Ophthalmic Epidemiol* 1998;5(3):143-169.
3. Knyazer B, Bilenko N, Levy J, et al. Open globe injury characteristics and prognostic factors in Southern Israel: a retrospective epidemiologic review of 10 years experience. *Isr Med Assoc J*. 2013;15(3):158-62.
4. Li EY, Chan TC, Liu AT, Yuen HK. Epidemiology of Open Globe Injuries in Hong Kong. *Asia Pac J Ophthalmol (Phila)*. 2017;6(1):54-58.
5. Regalado RN, Lim Bon Siong R, Agahan AL, Felipe A. Prognostic Value of the Ocular Trauma Score in Traumatic Open Globe Injuries in the Philippines: A Five-Year Retrospective Study – Prognostic Value of the Ocular Trauma Score in Open Globe Injuries. *OALibJ*. 2018; 5(1):1-12.
6. Kuhn F, Maisiak R, Mann L, Mester V, et al. The ocular trauma score (OTS). *Ophthalmol Clin North Am*. 2002;15(2):163-5.
7. Merca T, Valbuena M. Epidemiology and visual outcomes of pediatric ocular trauma cases in a tertiary hospital. *Philipp J Ophthalmol*. 2014;39:27-32.
8. Agrawal R, Wei HS, Teoh S. Prognostic factors for open globe injuries and correlation of Ocular Trauma Score at a tertiary referral eye care centre in Singapore. *Indian J Ophthalmol*. 2013;61:502-6.
9. Meng Y, Yan H. Prognostic factors for open globe injuries and correlation of Ocular Trauma Score in Tianjin, China. *J Ophthalmol*. 2015;2015:345764.
10. Health-Related Quality of Life Concepts. Available at: <https://www.cdc.gov/hrqol/concept.htm>. Accessed on September 1, 2018.
11. De Salvo KB, Bloser N, Reynolds K, He J, Mutner P. Mortality Prediction with a Single General Self-Rated Health Question: A Meta-Analysis. *J Gen Intern Med*. 2006;21(3):267-75.
12. Dominick KL, Ahern FM, Gold CH, Heller DA. Relationship of health-related quality of life to health care utilization and mortality among older adults. *Aging Clin Exp Res*. 2002;14(6):499–508.
13. Van Beeck EF, Larsen CF, Lyons RA, et al. Guidelines for the conduction of follow-up studies measuring injury related disability. *J Trauma*. 2007;62:534–550.
14. Herdman M, Gudex C, Lloyd A, Janssen MF, Kind P, Parkin D, Bonsel G, Badia X. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Qual Life Res*. 2011;20:1727-36.
15. Janssen MF, Pickard AS, Golicki D, Gudex C, Niewada M, Scalone L, Swinburn P, Busschbach J. Measurement properties of the EQ-5D-5L compared to the EQ-5D-3L across eight patient groups: a multi-country study. *Qual Life Res* 2013;22(7):1717-27.
16. Castillo-Carandang NT, Sison OT, Sy RG, et al. Establishing validity of EQ-5D-3L (Tagalog) to measure health-related quality of life states among adult Filipinos (20-50 years old). *Acta Med Philipp* 2018;2: 397-403.
17. Buchholz I, Janssen MF, Kohlmann T, et al. A systematic



- review of studies comparing the measurement properties of the three-level and five-level versions of the EQ-5D. *Pharmacoeconomics*. 2018;36: 645-661.
18. van Hout B, Janssen MF, Feng YS *et al*. Interim scoring for the EQ-5D-5L: mapping the EQ-5D-5L to EQ-5D-3L value sets. *Value Health*. 2012;15(5):708-15.
  19. Rofail M, Lee GA, O'Rourke P. Quality of life after open-globe injury. *Ophthalmology*. 2006;113(6):1057.e1-3.
  20. Yuksel H, Turkcu FM, Sahin M, Cinar Y, *et al*. Vision-related quality of life in patients after ocular penetrating injuries. *Arq Bras Oftalmol*. 2014;77(2):95-8.
  21. Karaman S, Ozkan B, Gok M, Karakaya I, *et al*. Effect of eye trauma on mental health and quality of life in children and adolescents. *Int Ophthalmol*. 2017;37(3):539-544.
  22. EQ-5D-5L Self-complete version on paper. [Internet] [Cited 21 Feb 2019] Available from: <https://euroqol.org/eq-5d-instruments/eq-5d-5l-available-modes-of-administration/self-complete-on-paper/>
  23. Kuhn F, Morris R, Witherspoon CD, Mester V. The Birmingham Eye Trauma Terminology system (BETT). *J Fr Ophthalmol*. 2004;27:206-210.
  24. Voon LW, See J, Wong TY. The epidemiology of ocular trauma in Singapore: perspective from the emergency service of a large tertiary hospital. *Eye*. 2001;15:75-81.
  25. Woo J, Sundar G. Eye injuries in Singapore – don't risk it. Do more. A prospective study. *Ann Acad Med Singapore*. 2006;35(10):706-18.
  26. Chaikitmongkol V, Leeungurasatien T, Sengupta S. Work-related eye injuries: important occupational health problem in Northern Thailand. *Asia Pac J Ophthalmol (Phila)*. 2015;4(3):155-60.
  27. Baba A, Zbiba W, Korbi M. Epidemiology of open globe injuries in the Tunisian region of Cap Bon: Retrospective study of 100 cases. *Tunis Med*. 2015;93(10):618-22.
  28. Chia EM, Mitchell P, Rochtchina E, Foran S, Wang JJ. Unilateral visual impairment and health related quality of life: the Blue Mountains Eye Study. *Br J Ophthalmol*. 2003;87(4):392-5.