Ocular trauma, visual acuity related to time of referral and psychosocial determinants, during COVID-19 pandemic: A prospective study

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Abstract. The aim of the present study was to explore the associations between visual outcomes of ocular injury patients in a tertiary hospital unit with clinical and demographic variables and to evaluate the psychosocial impact of the injury on the patients. An 18-month prospective study of 30 eye-injured adult patients was conducted in the General University Hospital of Heraklion, Crete, a tertiary referral hospital. All severe eye injury case information was prospectively collected between February 1, 2020 and August 31, 2021. Best corrected visual acuity (BCVA) was labelled not poor (>0.5/10 or >20/400 on the Snellen scale, <1.3 in LogMAR scale) and poor (≤0.5/10 or ≤20/400 on the Snellen scale, ≥1.3 on the LogMAR equivalent). Data regarding participants' perceived stress levels, by using Perceived Stress Scale 14 (PSS-14), were collected prospectively, one year after study end. Out of 30 ocular injury patients selected, 76.7% were men and most of them were self-employed and private or public sector workers (36.7%). Not poor final BCVA was related to not poor initial BCVA [odds ratio (OR) 1.714; P=0.006]. No statistical associations were found between visual outcome and demographic or clinical factors, but not poor final BCVA was associated with improved self-reported psychological condition of the sufferers, as examined by a questionnaire sheet developed to collect information for study purpose (8.36/10 vs. 6.40/10; P=0.011). No patient reported job loss or changed work status following the injury. Not poor initial BCVA was a significant predictor for not poor final visual outcomes (OR 1.714; P=0.006). Patients with not poor final BCVA expressed higher levels of positive psychology (8.36/10 vs. 6.40/10; P=0.011) and less fear of eye injury repetition (64.0 vs. 100.0%; P=0.286). Not poor final BCVA was associated with low PSS-14 scores one year after study end (77.3 vs. 0.0%, P=0.003). Collaboration between ophthalmologists, mental health professionals and primary care team may be important in order to help patients to cope with the psychosocial burden sequel to eye trauma.

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Abbreviations: COVID-19, coronavirus disease 2019; VA, visual acuity

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Introduction

Visual loss and impairment due to eye trauma are not only found to affect the visual acuity of patients, but also their quality of life, causing occupational and social dysfunctions (1). It negatively influences their daily activities, their working capacity and their well-being (1), thus it is inferred that deterioration in life quality might cause emotional problems to the victims (2). It has been proved that 11% of patients with ophthalmic trauma had faced depression, especially if in long term treatment (3). There is limited literature published about the psychological impact and the quality of life following an eye trauma on patients (2). Visual field and function test analysis do not provide such information (4,5). However, vision loss due to eye trauma may physically, emotionally, psychologically and economically have affected patients, families and society in general (6). Karaman *et al* (7) mention that parents with children who experienced lens damage were found to be influenced by negative emotions and expressed mild post-traumatic stress disorder.

Furthermore, Lax and Klein (8) reported that work-related eye injuries may cause severe income reduction due to loss of employment and debt increase in order to cover medical and personal expenses while others became uninsured for more

than a year. Additionally, most participants mentioned loss of work-related friendships and at the same time some disclosed loss of house or end of their marriage (8). The participants in the present study revealed feelings of loss of dignity and identity and deterioration of self-worth, signs of anxiety, dysthymia, depression and frustration (8). An eye injury is an important life event that can influence patients' emotions, roles within their social network and physical capacity (9). Patients' friends and family have an important role in the rehabilitation process, alongside with system support (9). Multidisciplinary approach is considered vital in order to maximize positive clinical outcomes (9).

The majority of eye injuries refer to men as they tend to be more involved in high risk occupations compared with women (3,10). Additionally, a case series study reported higher risk of ocular injuries at home for individuals with history of an eye condition. The explanation offered stressed that cancellations or postponement of follow-up visits or surgeries and inability to prescribe medicine caused delays in proper treatment (11). Moreover, a number of studies proved that prompt assessment, successful initial management, early presentation to the eye unit (12) and clinical factors were associated with good initial visual acuity (VA) (13), which in turn was a prognostic factor for final visual outcomes (12,14). However, VA has proved inadequate to assess fully the health in general, regarding social, physical and psychological impact on sufferers (1).

The main goal of the present study was to explore factors associated with visual outcomes, in terms of clinical and psychosocial parameters, especially during the period of coronavirus disease 2019 (COVID-19), as restrictive measures of quarantine and commuting led to further access limitation.

Methods

Study design, population and ethics approval. Data of the present study were collected prospectively during an 18-month period between February 1, 2020 and August 31, 2021 from eye injury patients admitted to the General University Hospital of Heraklion Crete, Greece, the only tertiary care center of Crete. The present study included all adult patients that met the following inclusion criteria: i) >18 years, ii) with severe eye injuries presented to the emergency department of Ophthalmology, iii) hospitalized at the ophthalmology clinic either for specialized medical care or treated after surgical intervention. Patients included in the study sample were subjected to standard clinical practice. All socio-demographic information was collected via interview by the researchers during hospitalization. Clinical data were recorded in cooperation with a specialized ophthalmologist who examined each patient at the ophthalmology emergency department until their discharge from the hospital unit. Additionally, it was planned to prospectively record Perceived Stress Scale 14 (PSS-14) levels one year after study end in order to avoid acute phase distress bias and assess any long term effect.

Patients were age grouped between 18-40, 41-66 and ≥67 years. Education included elementary, secondary, high school and university level. A total of four occupation categories were used: Manual workers, farmers/livestock workers, self-employed and private-public sector workers and unemployed. Injuries were grouped into open and closed globe injuries, according to the Birmingham Eye Trauma Terminology (15) and Ocular Trauma Classification Group (16). Visual outcomes were described through initial and final Best Corrected Visual Acuity (BCVA) converted from the Snellen chart to the Logarithm of the Minimum Angle of Resolution (LogMAR) to allow comparisons of different variables (17). The initial and final BCVA were documented on presentation at the ophthalmology emergency department and after outpatient follow-up. It was conventionally labelled as not poor (>0.5/10 or >20/400 on the Snellen scale; <1.3 in LogMAR scale) or poor (≤0.5/10 or ≤20/400 on the Snellen scale; ≥1.3 on the LogMAR equivalent) (18). Admission time to hospital was quantified as ≤2 h and >2 h, while the residence distance (in kilometers) was classified as 0-20, 21-60 and >61 km.

Information on overall psychosocial status of the patients was assessed through a questionnaire sheet for data collection. Most questions were dichotomous (yes/no) while one question was scored by using a Likert scale of 1-10 points, (1, very bad; 5, moderate and 10, good) via telephone interview after a 6-month follow-up period. The same questionnaire collected information about patients' satisfaction regarding the medical service provision, the fear of incident repetition, patients' recovery from the eye trauma and changing work status.

Perceived Stress Scale 14 (PSS-14) is a 14-item tool created by Cohen *et al* (1983) to measure perceived stress (19). The Greek version of PSS-14 was validated by Andreou *et al* (20) and uses a Likert-type rating from 0 to 4 (0=never to 4=very often). Higher score indicates higher perceived stress levels after the summation of the items and the reversal of the seven positive questions (20). The scores were grouped into three categories: Low (0-18), moderate (19-37) and high (38-56) (21). All data were collected according to Declaration of Helsinki guidelines to assure confidentiality. The study was also approved by the Scientific Council of the 7th Health District of Crete (protocol no. 17/30-10-2019) and the Scientific Ethics and Deontology Committee of the University of Crete (protocol no. 28/07-02-2020). Verbal and written informed consent was obtained from the patients.

Statistical analysis. All variables were summarized using descriptive statistics. For each variable the number of counts and the respective percentage was presented. Univariate analyses were performed using Fisher's exact test (for binary variables) and Pearson's Chi-square test with Yate's continuity correction (in case of non-binary categorical variables). Means with standard deviation were based on independent samples T-test for the question 'How well do you currently feel in psychological terms?', a 10 Likert scale rating. Odds ratios were calculated using simple logistic regression models with final BCVA (not poor vs. poor) as dependent variable. The statistical software used was SPSS version 24 (IBM Corp.). $P<0.05$ was considered to indicate a statistically significant difference.

Results

The present study covered 30 patients, most of whom were men (76.7%) aged between 41-66 years (56.7%). The majority of participants were Greek (83.3%), had received elementary

education (40.0%) and were married (86.7%). As to their occupation, 20.0% were manual workers, 26.7% farmers/livestock workers, while 36.7% were self-employed/private/public sector workers (Table I). Results from Table II indicated that not poor final BCVA was related with not poor initial BCVA [odds ratio (OR) 1.714; P=0.006] and patients with not poor final BCVA did not need surgical intervention (OR 1.500; P=0.042). No significant associations were observed between final BCVA (not poor or poor) and the type of injury, the occupation, the distance from the residence place and the time of admittance to hospital (P>0.05).

The present study compared patients according to their final BCVA (not poor vs. poor). All patients in both groups reported being satisfied with the health care services (100% in both groups). Patients with not poor final BCVA reported significantly improved feelings in terms of psychological status, compared with patients with poor final BCVA (8.36 vs. 6.40; P=0.011).

Patients with not poor final BCVA reported fear of incident repetition to a lesser extent compared with participants with poor final BCVA. The majority of patients (68%) with not poor final BCVA reported recovery from trauma compared with no (0%) patient in the poor final BVCA group (P=0.009).

Hospitalization for eight days or more was more frequent in patients with poor final BCVA compared with patients in the not poor final BCVA group (60 vs. 24%; P=0.143). No patients reported changing their work status and the days of absence from work were similar in both groups.

Patients in the poor final BCVA group reported paying more money in personal expenses (P=0.019) and reported limiting their social activities to a higher extent (100 vs. 52.9%; P=0.050). Finally, the reported PSS-14 scores were significantly higher in patients in the poor final BCVA group (P=0.003; Table III).

Table I. Socio-demographic characteristics of eye injuries (n=30).

Characteristic	n	%
Sex		
Male	23	76.7
Female	7	23.3
Age, years		
18-40	10	33.3
41-66	17	56.7
66+	3	10.0
Mean ± standard deviation (min, max)		
48.3±15.2 (21,78)		
Education		
Elementary	12	40.0
Secondary	6	20.0
Higher	9	30.0
University	3	10.0
Family status		
Married	26	86.7
Unmarried, divorced, widowed	4	13.3
Nationality		
Greek	25	83.3
Other	5	16.7
Occupation		
Manual workers	6	20.0
Farmers/livestock workers	8	26.7
Self-employed/private-public sector employees	11	36.7
Unemployed	5	16.7
Insurance status		
Public insurance	0	0
Private insurance	15	50.0
Agricultural insurance	10	33.3
Social security/self-employment insurance	3	10.0
Uninsured	2	36.7

Discussion

To the to the best of the authors' knowledge, the present study is the first to explore the psychological status of eye injury patients with visual outcomes in the geographical region of Crete, Greece and there are few published studies on this subject worldwide (2,3). Most of the eye injuries occurred among men, as expected in accordance with other studies (3,12-14). The study revealed that most of eye injuries (36.7%) occurred among self-employed and private-public sector employees, in contrast with studies where most of eye injuries occurred among manual force workers, mainly occupied in farming activities in rural areas (3,10). During COVID-19, self-employment activity might have been increased and available skills might be poor or weakened, a fact that could influence the frequency of such injuries. Work-related eye injuries are considered frequent and therefore it is an issue related to public health (22).

A number of studies proved that the type of injury (3,13), admittance time and the distance from the hospital unit are indicators for visual prognosis (10,12). Manual force workers for instance, or those occupied in agricultural activities exhibit an additional eye injury risk from flying objects (3,10,23,24). In contrast with these studies, the present study found no significant associations between visual outcomes (not poor or poor) and the type of injury, occupation, the distance and the admittance time to the hospital. This is may be due to the fact that most of the injured patients resided permanently near the hospital (0-20 km) or within the prefecture of Heraklion and were admitted in <2 h to the hospital unit. Moreover, during the study period, there were travel bans between the four prefectures of Crete due to COVID-19 restrictions. Therefore, a number of eye traumas were eventually managed in local hospital units and patients did not decide, or were advised, to seek distant care with their own transportation means.

The present study also showed that there was a significant association between initial BCVA and not poor final visual outcomes, in line with other studies (12,14,23), while a retrospective study by Kyriakaki *et al* (submitted) at the same hospital reported similar results. Additionally, according to the findings presented, patients with not poor final BCVA did not need surgical intervention. The latter

Table II. Factors associated with visual outcomes (n=30).

Factors	Final visual acuity (LogMar scale)		Odds ratio	P-value
	Not poor (%)	Poor (%)		
Initial visual acuity (LogMar scale)			1.714 (1.063-2.765)	0.006
Not poor	18 (72.0)	0 (0.0)		
Poor	7 (28.0)	5 (100.0)		
Type of injury			1.313 (0.921-1.871)	0.157
Closed globe injury	15 (60.0)	1 (20.0)		
Opened globe injury	10 (40.0)	4 (80.0)		
Occupation				0.981
Manual workers	5 (20.0)	1 (20.0)	Reference group	
Farmers/livestock workers	7 (28.0)	1 (20.0)	0.714 (0.036-14.347)	0.826
Self-employed/private-public sector employees	9 (36.0)	2 (40.0)	1.111 (0.079-15.534)	0.938
Unemployed	4 (16.0)	1 (20.0)	1.250 (0.058-26.869)	0.887
Residence distance from hospital (km)				0.206
0-20	14 (56.0)	2 (40.0)	Reference group	
21-60	0 (0.0)	1 (20.0)	1.131 (0.010-11.235)	0.143
61+	11 (44.0)	2 (40.0)	1.273 (0.154-10.530)	0.823
Time of admittance to hospital			1.185 (0.823-1.708)	0.364
≤2 h	16 (64.0)	2 (40.0)		
>2 h	9 (36.0)	3 (60.0)		
Surgical intervention			1.500 (1.049-2.145)	0.042
No	15 (60.0)	0 (0.0)		
Yes	10 (40.0)	5 (100.0)		

finding was in contrast with a study where delayed surgical intervention was reported as a factor related to poor visual outcomes (12). A possible interpretation could be that most of the eye injuries were closed globed, thus less severe and probably were properly managed due to early presentation to the hospital unit.

As shown in Table III, patients with not poor final BCVA reported an improved psychological condition and reported less fear of incident repetition, than those with poor final BCVA (64.0 vs. 100.0%; P=0.286). However, in a study conducted in the UK population, it was found that patients who lost an eye due to severe eye trauma experienced stigmatization and fear of negative social evaluation (25). Additionally, they had an ongoing anxiety of trauma repetition and loss of sight in the healthy eye (25). Working with local communities in order to offer support for individuals with ocular trauma is of critical importance for their recovery.

The findings of the present study indicated that PSS-14 scores were significantly higher in patients with poor final BCVA one year after the study end. To the best of the authors' knowledge, there are limited studies that explore similar associations. However, individuals with dry eye disease (DED) had higher level of perceived stress as measured by PSS (4-item version) in comparison with a non-DED group (26). Moreover, a study about patients with primary open-angle glaucoma, mentioned higher levels of perceived stress were related to lower BCVA in the healthier eye (27). The aforementioned studies refer to chronic eye conditions, however, perceived stress and mental health state repercussions, need to be considered in the management of patients with either eye trauma or chronic ocular conditions.

There is a need to stress that all patients with not poor or poor final BCVA reported being satisfied from healthcare services provision during hospitalization and follow-up, but this association was not significant. To the best of the authors' knowledge, there is limited research regarding patients' satisfaction from healthcare facilities and the way that this satisfaction interact with their feelings in terms of recovery from a severe eye injury and the psychological status during hospitalization or after discharge. Further research should be conducted to cast more light on this issue using appropriately designed tools. The' psychological impact of severe eye injuries should be evaluated and behavioral interventions could be initiated to help sufferers cope with all possible difficulties arisen. The multilevel effect of eye injuries to the patients is clear and should be taken into consideration by policy makers and health providers during the rehabilitation process.

Time of admission or delay is an important factor for the final BCVA and the recovery of the patient, according to a recent retrospective study (28). Most severe eye injury patients reported that they were hospitalized for <8 days (P=0.143). Another study also stressed that patients were hospitalized from 3-5 days for all types of ocular injuries (29). Finally, in the present study no patient needed to change work status

Table III. Psycho-social determinants in not poor/poor final visual acuity groups (n=30).

Psycho-social determinant	Final visual acuity (LogMar scale)		Odds ratio	P-value
	Not poor	Poor		
Were you overall satisfied from health care services received? (Yes/No; number of positive answers)[a]	25 (100%)	5 (100%)	[b]	-
How well do you currently feel in psychological terms? [from 1-10; Likert scale (1=very bad, 5=moderate, 10=very good)][a]	8.36 (1.47)	6.40 (1.52)	0.449 (0.22-0.94)	0.011
Do you feel fear of similar incident repetition in the future? (Yes/No; number of positive answers)[a]	16 (64.0%)	5 (100.0%)	0.762 (0.60-0.97)	0.286
Have you already recovered from your ophthalmic trauma? (Yes/No; number of positive answers)[a]	17 (68.0%)	0 (0.0%)	1.625 (1.06-2.45)	0.009
How many days of hospitalization did you spend?[a]			4.750 (0.64-35.5)	0.143
0-7 days	19 (76.0%)	2 (40.0%)		
8+ days	6 (24.0%)	3 (60.0%)		
Did you change your work status due to your ophthalmic trauma? (Yes/No; number of positive answers)[a]	0 (0.0%)	0 (0.0%)	[b]	-
How many days of sick leave did you get? [a]			1.375 (0.84-2.20)	0.208
0-7 days	19 (76.0%)	2 (40.0%)		
8+ days	6 (24.0%)	3 (60.0%)		
What were your personal expenses (euros) due to your ophthalmic trauma? [a]	50 (0-300;55)	80 (0-4000;340)	1.010 (1.00-1.02)	0.019
Were your social activities restricted? (Yes/No; number of positive answers)[a]	9 (52.9%)	5 (100.0%)	1.556 (1.05-2.30)	0.050
PSS-14 score levels[c]			[b]	0.003
Low (0-18)	17 (77.3%)	0 (0.0%)		
Moderate (19-37)	5 (22.7%)	4 (80.0%)		
High (38-56)	0 (0.0%)	1 (20.0%)		

[a]Six month follow up assessment. [b]Odds ratios could not be produced. [c]One year follow-up after study end.

following the injury. Most of the patients mentioned that they recovered from their health problem (P=0.009) and so they returned to their duties. Some other patients might not be able to change work activity. In line with a study in Germany, only one patient, with open globe injury, changed work status (30). By contrast, a study in a Turkish population group reported that patients with vision loss had to change their occupation after the injury (31).

The main strength of the present study was that all data were prospectively selected, thus the information was accurate and complete concerning psychosocial outcomes, even after a long period from the eye injury. On the other hand, there were certain limitations to the present study. A number of eye injuries might not be included in the present study as they could have been managed by private ophthalmologists, local secondary or first aid units due to COVID-19 transportation restrictions. However, it is considered that the present study managed to collect more severe injuries as they required specialized treatment at a tertiary University Hospital. In addition, the study sample was limited during the study period and may not be representative for all eye injuries throughout the geographical region of Crete, as there were suspensions of work, again due to COVID-19 protective measures. As concluded by Liang *et al* (32) in their literature review, the COVID-19 period and the restrictions implemented led to a 67.7% drop in incidents of ocular trauma compared with previous years. Additionally, they mentioned alterations in the categories of eye injuries, since there was an increase in injuries occurring at home and a decrease of eye injuries in other activities such as work-related incidents (32). Furthermore, Anyfantakis *et al* (33) noted that COVID-19 pandemic revealed the importance of communication and collaboration between the different levels of health care (primary, secondary and tertiary) in order to improve attention to the needs of patients and proposed the active operation of e-communication. That practice could apply to eye trauma patients particularly in cases where transfer to a tertiary hospital is not a feasible option, as it was during the COVID-19 restrictions.

Further studies should be conducted throughout Greece, focusing on special geo-epidemiological features to identify factors related to visual outcomes and the psychological impact on the overall health of patients. Eye care practitioners

should pay attention to the psychological needs of the patients, especially those severely injured, and help them cope with implications subsequent to the injury. Referral pathways and collaboration with other professionals could be established to address the needs of patients holistically. Moreover, a system of social interventions should be initiated, in terms of protective strategies and rehabilitation of visual impaired or disabled patients.

In conclusion, not poor initial BCVA was significantly associated with not poor final visual outcomes. Self-employed and workers of private-public sector had increased risk of experiencing an eye injury, despite the non-significant association. Patients with not poor final BCVA had significantly increased levels of positive psychology and low levels of perceived stress. Not poor final BCVA was also correlated to a reduced fear of incident repetition, while all patients with not poor or poor final visual acuity were satisfied from healthcare services provision, with no significant trend. Collaboration between ophthalmologists and mental health professionals is considered important in order to help patients to eliminate the psychological burden that eye injury entails.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

EK, ED and ES conceived and designed the present study, interpreted the data and drafted the manuscript. EK performed data collection. AB performed data analysis and interpretation and drafted the manuscript. GM contributed to data analysis, data synthesis and interpretation and writing the manuscript. NT contributed organizational support, informational input and contributed to writing the manuscript. PV performed literature review, data synthesis and contributed to writing and revision of the manuscript. DS revised the manuscript and contributed intellectual input with meaningful content suggestions. ES and ED provided theoretical and intellectual input for implementation of the present study, manuscript drafting and critical revision. EK and NT confirm the authenticity of all the raw data. All authors read and approved the final manuscript.

Ethics approval and consent to participate

All data was collected according to Declaration of Helsinki guidelines to assure confidentiality. The present study was also approved by the Scientific Council of the 7th Health District of Crete (protocol no. 17/30-10-2019) and the Scientific Ethics and Deontology Committee of the University of Crete (protocol no. 28/07-02-2020). Verbal and written informed consent was obtained from the patients.

Patient consent for publication

Not applicable.

Competing interests

DS is the Editor-in-Chief for the journal, but had no personal involvement in the reviewing process, or any influence in terms of adjudicating on the final decision, for this article. Another member of the editorial board handled the manuscript as editor. The other authors declare that they have no competing interests.

References

1. Le Q, Chen Y, Wang X, Li Y, Hong J and Xu J: Vision-related quality of life in patients with ocular chemical burns. Invest Ophthalmol Vis Sci 52: 8951-8956, 2011.
2. Yüksel H, Türkcü FM, Ahin M, Cinar Y, Cingü AK, Ozkurt Z, Bez Y and Caça H: Vision-related quality of life in patients after ocular penetrating injuries. Arq Bras Oftalmol 77: 95-98, 2014.
3. Niyazova Z and Buzrukov B: Eye injury as a reason for disability. Int J Adv Sci Technol 29: 1356-1364, 2020.
4. Massof RW and Rubin GS: Visual function assessment questionnaires. Surv Ophthalmol 45: 531-548, 2001.
5. Vitale S and Schein OD: Qualitative research in functional vision. Int Ophthalmol Clin 43: 17-30, 2003.
6. Brilliant LB, Pokhrel RP, Grasset NC, Lepkowski JM, Kolstad A, Hawks W, Pararajasegaram R, Brilliant GE, Gilbert S and Shrestha SR: Epidemiology of blindness in Nepal. Bull World Health Organ 63: 375-386, 1985.
7. Karaman S, Ozkan B, Gok M, Karakaya I, Kara O, Altintas O and Altintas L: Effect of eye trauma on mental health and quality of life in children and adolescents. Int Ophthalmol 37: 539-544, 2017.
8. Lax MB and Klein R: More than meets the eye: Social, economic, and emotional impacts of work-related injury and illness. New Solut 18: 343-360, 2008.
9. Lester EG, Armstrong GW and Vranceanu AM: Emotional recovery after ocular trauma: Is there more than meets the eye? Eye (Lond) 36: 244-245, 2021.
10. Sukati VN: Workplace eye injuries : A literature review. Occup Heal South Africa 20: 18-22, 2014.
11. Alqudah AA, Dwairi RAA, Alqudah NM and Abumurad SK: COVID-19 lockdown and eye injury: A case series from jordan. Int Med Case Rep J 13: 493-501, 2020.
12. Omotoye OJ, Ajayi IA, Ajite KO and Bodunde OF: Factors responsible for poor visual outcome following emergency eye surgery in a tertiary eye centre. Ethiop J Health Sci 29: 631-638, 2019.
13. Abu EK, Ocansey S, Gyamfi JA, Ntodie M and Morny EK: Epidemiology and visual outcomes of ocular injuries in a low resource country. Afr Health Sci 20: 779-788, 2020.
14. Hui RN, Shew FC, Khai-Siang C, Mei FC and Mushawiahti M: The epidemiological profile of open globe injuries and prognostic factors in a tertiary care centre. Cureus 13: e15846, 2021.
15. Kuhn F, Morris R and Witherspoon CD: Birmingham eye trauma terminology (BETT): Terminology and classification of mechanical eye injuries. Ophthalmol Clin North Am 15: 139-143, 2002.
16. Pieramici DJ, Sternberg P Jr, Aaberg TM, Bridges WZ Jr, Capone A Jr, Cardillo JA, de Juan E Jr, Kuhn F, Meredith TA, Mieler WF, *et al*: A system for classifying mechanical injuries of the eye (globe). The ocular trauma classification group. Am J Ophthalmol 123: 820-831, 1997.
17. Holladay JT: Visual acuity measurements. J Cataract Refract Surg 30: 287-290, 2004.
18. Upaphong P, Supreeyathitikul P and Choovuthayakorn J: Open globe injuries related to traffic accidents: A retrospective study. J Ophthalmol 2021: 6629589, 2021.
19. Cohen S, Kamarck T and Mermelstein R: A global measure of perceived stress. J Health Soc Behav 24: 385-396, 1983.

20. Andreou E, Alexopoulos EC, Lionis C, Varvogli L, Gnardellis C, Chrousos GP and Darviri C: Perceived stress scale: Reliability and validity study in Greece. Int J Environ Res Public Health 8: 3287-3298, 2011.
21. Higgins M: Chapter 5 perceived stress scale. In: The center for health discovery and well-being (CHDWB) Book. Higgins M (ed.), 2018.
22. Harrak E, Naoum S, Khawaja O, Salhi Y, Laib S and El Sanharawi M: Occupational eye trauma: A major public health issue in France. Eur J Public Health 30, 2020.
23. Alem KD, Arega DD, Weldegiorgis ST, Agaje BG and Tigneh EG: Profile of ocular trauma in patients presenting to the department of ophthalmology at Hawassa University: Retrospective study. PLoS One 14: e0213893, 2019.
24. Uhumwangho OM, Njinaka I, Edema OT, Dawodu OA and Omoti AE: Occupational eye injury among sawmill workers in nigeria. Asian J Med Sci 2: 233-236, 2010.
25. Keys J, Dempster M, Jackson J, Williams M and Coyle S: The psychosocial impact of losing an eye through traumatic injury and living with prosthetic restoration: A thematic analysis. Acta Psychol (Amst) 219: 103383, 2021.
26. Hyon JY, Yang HK and Han SB: Association between dry eye disease and psychological stress among paramedical workers in korea. Sci Rep 9: 3783, 2019.
27. Ji M, Kim JS, Baek SU, Kim YK, Nam KT, Lee JY, Lee HJ, Jeong J and Ha A: Perceived stress levels and associated factors in adult patients with primary open-angle glaucoma: A prospective survey study. Korean J Ophthalmol 36: 443-451, 2022.
28. Fernandez EO, Miller HM, Pham VQ and Fleischman D: Comparison of time-to-surgery and outcomes in transferred vs non-transferred open globe injuries. Clin Ophthalmol 16: 2733-2742, 2022.
29. Chang CH, Chen CL, Ho CK, Lai YH, Hu RC and Yen YL: Hospitalized eye injury in a large industrial city of South-Eastern Asia. Graefes Arch Clin Exp Ophthalmol 246: 223-228, 2008.
30. Schrader WF: Open globe injuries: Epidemiological study of two eye clinics in Germany, 1981-1999. Croat Med J 45: 268-274, 2004.
31. Toprak AB, Eser E, Guler C, Baser FE and Mayali H: Cross-validation of the Turkish version of the 25-item national eye institute visual functioning questionnaire (NEI-VFQ 25). Ophthalmic Epidemiol 12: 259-269, 2005.
32. Liang H, Zhang M, Chen M, Lin TPH, Lai M and Chen H: Ocular trauma during COVID-19 pandemic: A systematic review and meta-analysis. Asia Pac J Ophthalmol (Phila) 11: 481-487, 2022.
33. Anyfantakis D, Mantadaki AE, Mastronikolis S, Spandidos DA and Symvoulakis EK: COVID-19 pandemic and reasons to prioritize the needs of the health care system to ensure its sustainability: A scoping review from January to October 2020 (Review). Exp Ther Med 22: 1039, 2021.