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A ten-year study of clinical presentation and predictive factors on final visual outcome in paediatric trauma patients

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Abstract

Purpose: To present the demographic and clinical presentation, and to evaluate the predictive factors for final visual outcomes in paediatric ophthalmic trauma.
Methods: A retrospective observational study was conducted in Indonesia's private tertiary eye hospital between 2012 and 2021.
Results: A total of 194 patients/201 eyes were included. Closed globe injuries (CGI) represented the most common injury (80/194, 41.2%), followed by adnexal injury (65/194, 33.5%), open globe injuries (OGI) (30/194, 15.5%), chemical injuries (13/194, 6.7%), orbital fracture (3/194, 1.5%), and fireworks injuries (3/194, 1.5%). The mean age was 8.60 ± 5.23 years, with children aged 11–18 years (69/194, 35.5%) comprising the majority of cases. The home (43/201, 21.4%) and blunt trauma (105/201, 52.2%) were identified as the most common setting and mechanism of injury, respectively. There were 78/201 (38.8%) eyes included in the visual acuity (VA) predictors analysis.

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The mean initial VA and final VA were 0.595 ± 0.775 logMAR and 0.461 ± 0.790 logMAR, respectively. A strong correlation between initial VA, final VA, and type of injury was found (r = 0.761, P < 0.001), with 13/78 (16.7%) patients having severe visual impairment and blindness. In multivariate analysis, initial VA (P = 0.003), scleral injury (P = 0.013), and hyphaema (P = 0.013) were statistically significant as visual outcome predictors.
Conclusions: CGI and adnexal injury show high incidence in paediatric ophthalmic trauma. The home is the most common setting for paediatric ophthalmic trauma. OGI causes visual impairment to blindness. Initial VA, scleral injury, and hyphaema are identified as visual outcome prognostic factors.

Keywords: Birmingham Eye Trauma Terminology, paediatric ophthalmic trauma, predictive factors, visual outcomes

Kajian selama sepuluh tahun ke atas manifestasi klinikal dan faktor mempengaruhi penglihatan selepas trauma dikalangan kanak-kanak

Abstrak

Tujuan: Mengkaji taburan demografi dan persembahan klinikal serta faktor prediktif ke atas penglihatan terakhir berikutan trauma okular dikalangan kanak-kanak.
Kaedah kajian: Kajian pemerhatian secara retrospektif telah dijalankan di hospital tertiari swasta, Indonesia di antara 2012 dan 2021.
Keputusan: Seramai 194 pesakit (201 mata) telah terlibat dalam kajian ini. Didapati kecederaan glob tertutup (closed globe injury-CGI) merupakan jenis kecederaan yang paling kerap (80/194, 41.2%), diikuti oleh kecederaan adnexal (65/194, 33.5%), kecederaan glob terbuka (open globe injuries-OGI) (30/194, 15.5%), kecederaan akibat bahan kimia (13/194, 6.7%), kepatahan tulang orbital (3/194, 1.5%), dan kecederaan akibat bunga api (3/194, 1.5%). Min umur kanak-kanak adalah 8.60 ± 5.23 tahun, dimana kebanyakannya adalah kanak-kanak berusia 11–18 tahun (69/194, 35.5%). Manakala rumah (43/201, 21.4%) merupakan tempat utama kejadian kecederaan berlaku dan kecederaan akibat benda tumpul (105/201, 52.2%) adalah merupakan mekanisma utama kecederaan. Sebanyak 78 mata (38.8%) dianalisakan dalam analisa prediktor (ramalan) ketajaman penglihatan. Min ketajaman penglihatan awal dan terakhir adalah seperti berikut 0.595 ± 0.775 logMAR dan 0.461 ± 0.790 logMAR. Terdapat korelasi yang kukuh di antara ketajaman penglihatan awal dan terakhir serta jenis kecederaan (r = 0.761, p < 0.001), di mana seramai 13 orang

pesakit (16.7%) menunjukkan kehilangan penglihatan yang teruk dan kebutaan. Dengan menggunakan analisa multivariat, didapati ketajaman penglihatan awal (p = 0.003), kecederaan pada sklera (P = 0.013) dan kehadiran hyphaema (P = 0.013) merupakan prediktor yang signifikan secara statistik.
Kesimpulan: Insiden yang tinggi bagi CGI dan kecederaan adnexa dilihat pada kanak-kanak yang mengalami kecederaan okular. Rumah merupakan tempat utama di mana kecederaan berlaku pada kanak-kanak ini. Kecederaan OGI merupakan penyebab utama kebutaan di kalangan mereka. Tahap ketajaman penglihatan awal, kecederaan melibatkan sklera dan hyphaema merupakan factor prognosis bagi ketajaman penglihatan di kalangan kanak-kanak ini.

Kata kunci: Birmingham Eye Trauma Terminology, faktor prediktif, hasilan penglihatan, kecederaan oftalmik dikalangan kanak-kanak,

Introduction

Ophthalmic trauma is known as the major cause of non-congenital monocular blindness in children.[1-3] Although paediatric ophthalmic trauma typically occurs accidentally, the majority of cases are preventable.[4,5] Every year, there are 2.4 million reported cases of ocular trauma in the United States.[6] From statistics, 35% of these traumas occurs in children aged 17 and under, and 16% of them causes permanent visual impairment.[6-7]

Orbito-facial trauma, such as cranio-orbital, orbital-facial fractures, and facial soft tissue injuries, might be related to all the spectrum of ophthalmic trauma, which includes ocular, adnexal (eyelid and lacrimal), and orbital trauma.[8] The Birmingham Eye Trauma Terminology (BETT) system classifies ocular trauma into closed globe injuries (CGI), defined as non-full-thickness wounds of the eye wall (cornea or sclera), and open globe injuries (OGI), defined as at least one full-thickness wound to the eye wall.[9-10] CGI are considered to be less frequent and less severe than OGI.[11-12] A previous study from the United Kingdom reported 76.7% of globe injuries,[5] whereas China documented OGI (54.1%) and CGI (38.8%) as the most common injuries.[11]

Owing to unreliable reporting, a variable medical history, and poor cooperation during the examination, initial assessment in children is quite challenging. In spite of major advancements in surgical techniques, the management of OGI in children remains complex.[14] Amblyopia is an additional consequence of monocular injuries in children, which makes its management more difficult.[13-15]

Even though there are several previous studies of ophthalmic trauma in Indonesia, this was the first study to focus specifically on numerous paediatric ophthalmic patients in Jakarta. This study aims to present the demographic and clinical presentation of paediatric ophthalmic patients. Furthermore, it also aims

to evaluate the predictive factors for final visual outcomes in paediatric ophthalmic trauma who were admitted to a private tertiary eye hospital in Jakarta, Indonesia.

Methods

Patients

A retrospective observational study was conducted in Jakarta Eye Centre (JEC) Eye Hospitals from 2012–2021. The medical records of 194 children aged 0-18 years who had ophthalmic injuries and were either hospitalized or visited the outpatient clinic were included. Ethical approval for this study was obtained from The Medical and Health Research Ethics Committee, Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada – Dr. Sardjito General Hospital with reference number KE/FK/0161/EC/2021 and complies with the tenets of the Declaration of Helsinki.

Data collection procedures

The medical records of all paediatric ophthalmic trauma patients who presented to Jakarta Eye Centre (JEC) Eye Hospitals from 2012–2021 were collected. Consecutive sampling was conducted, then used for demographic and clinical presentation analysis. After the data had been reviewed, patients who had data on visual acuity (VA) for 6 months following initial trauma were included in the visual outcome predictive factors analysis.

Measures

The patients were identified through electronic medical records using the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes which includes S04, S05 (S05.0-S05.9), and S09 codes. Demographic and clinical data were recorded, including additional information relating to the injury. The injuries were then classified with the BETT system and divided into six groups.[9,10] Visual outcomes were classified according to the the World Health Organization's (WHO) classification.[16]

Statistical analysis

All data were entered into Microsoft Excel for the initial calculation of descriptive statistics. Snellen VA was converted into logMAR equivalent for statistical analysis. Statistical analysis was performed using SPSS Statistics for Mac version 25 (SPSS Inc., Chicago, IL, USA). Univariate analysis of visual outcome predictors was evaluated using Pearson's chi-square and Fisher's exact test. Multivariate analysis used binary logistic regression. A value of $p < 0.05$ was considered statistically significant. Parameters of the normal distribution are reported as mean ± standard deviation (SD).

Results

Age, gender, laterality, occupation, clinical findings, primary diagnosis, complications, prior medical history, initial and final VA, and management were the demographic and clinical data gathered in this study. Additional information related to the injuries was also collected, such as cause of the injury, eye protection usage, place, mechanism, object, and nature of the injury.

A total of 897 ophthalmic trauma patients were admitted to our hospital, 194 (201 eyes) among them were children (21.6%). The mean age was 8.60 years with the number of male patients (66.5%) being almost 2 times that of female patients (33.5%) across all ages groups ($p = 0.760$). According to the BETT classification, the data divided into six groups consisting of OGI, CGI, adnexal injury, orbital fracture, chemical injury, and fireworks injury. CGI (80, 41.2%) was the leading cause of trauma, followed by adnexal injury (65, 33.5%), and OGI (30, 15.5%). Nearly all the patient demonstrated unilateral injury (96.4%). The patients' demographic data are summarized in Table 1.

The age group with the highest number of cases was 11–18 years (69, 35.5%), more than half (39, 20.1%) of whom suffered CGI. The age group with the second highest number of cases was 6–10 years (60, 30.94%), among which 23 (11.86%) suffered CGI. The distribution of type of injury by age group is presented in Figure 1**.**

Blunt trauma (105, 52.2%) was the dominant mechanism of injury, followed by projectile and chemical burn (each 25, 12.4%). According to the nature of injuries, accidental (192, 95.5%) was the most commonly reported, with a small number of self-inflicted injuries (3, 1.5%). The records for most patients (117, 58.2%) did not indicate the setting of injury. For those cases where the setting was recorded, the home (43, 21.4%) was the most frequent, followed by outdoor chores (12, 6.0%), and sports-related (10, 5.0%).

Traumatic agents of injuries were classified as blunt objects, sharp objects, chemicals, fireworks, sports-related, and some uncommon agents causing injury (dog bites, arrows, toothbrushes, curtains, melodicas, and hats). Blunt objects (90, 46.4%) predominated among the injuries, including other blunt objects (78, 40.2%), blunt wood (6, 3.1%), blunt body parts (3, 1.5%), and plastic toys (3, 1.5%). One in five injuries (41, 21.2%) were caused by sharp objects, including sharp metal (14, 7.2%), other sharp objects (9, 4.6%), sharp wood (8, 4.1%), and sharp body parts (5, 2.6%). Acid (9, 4.6%), alkaline (2, 1.0%), and super glue (2, 1.0%) were the chemicals that caused injuries (16, 8.0%). Fireworks (3, 1.5%) and sports-related objects (13, 6.7%), including airsoft guns, arrows, basketballs, badminton racquets, and shuttlecocks, were responsible for the remaining injuries. The materials that caused the injuries are displayed in Figure 2.

Most patients had anterior segment injury (107, 53.2 %), followed by posterior segment (16, 8.0 %), both segments (11, 5.5 %), and adnexal (67, 33.3 %) as their clinical presentation of trauma. Zone I (46, 57.5%) injuries comprised the most

Table 1. Demographic data of the patients

Description	Boys (n = 129, 66.5%)	Girls (n = 65, 33.5%)	Total (N = 194, 100%)
Age group (years)			
0–2	17	10	27 (14.0%)
3–5	23	15	38 (19.6%)
6–10	42	18	60 (30.9%)
11–18	47	22	69 (35.5%)
Type of injury			
CGI	54	26	80 (41.2%)
Contusion (n = 51, 71.3%)	40	17	
Lamellar laceration (n = 11, 13.7%)	9	2	
Superficial foreign body (n = 12, 15.0%)	5	7	
OGI	24	6	30 (15.5%)
Rupture (n = 15, 50.0%)	12	3	
Penetrating (n = 15, 50.0%)	12	3	
IOFB	N/A	N/A	
Perforating	N/A	N/A	
Adnexal injuries	40	25	65 (33.5%)
Orbital fracture	3	N/A	3 (1.5%)
Chemical injuries	6	7	13 (6.7%)
Fireworks injuries	2	1	3 (1.5%)
Laterality			
Unilateral	125	62	187 (96.4%)
Bilateral	4	3	7 (3.6%)

IOFB: intraocular foreign body; SD: standard deviation; N/A: not available
Data are presented as number (percentage).

frequent zone injuries in CGI, followed by Zone III (20, 25.0%) and Zone II (14, 17.5%). For OGI, Zone I (73.3%) injuries accounted for most cases, followed by Zone II (8, 26.7%), and an absence of Zone III injuries. The correlation between zone and type of injury was statistically significant (P = 0.010). Palpebral hematoma (46, 22.9%) as the predominant hallmark of adnexal damage, corneal rupture (25, 12.4%) and subconjunctival haemorrhage (20, 10.0%) were the most prevalent findings in OGI and CGI. Additionally, we identified patients who had endophthalmitis owing to OGI (3/201, 1.5%), all of whom presented to the hospital more than 48 hours after the injury and whose cause of injury were organic or unclean substances, including bottle openers, twigs, and pens. Their final vision was increased to 0.1 and 0.2, despite the fact that their initial VA was hand movement (HM). Details on clinical presentation are provided in Figure 3.

Most patients received conservative treatment with medication (148, 73.6%), and the remaining underwent surgery (34, 16.9%) due to OGI and adnexal injury (each 15, 44.1%). There were 3 patients with prior surgeries (1.7%) at a different hospital, including palpebral repair (1), corneal repair (1), and craniotomy (1), all as a result of blunt trauma. There were also several patients who declined any treatment or surgery (16, 8.0%). OGI repair (15, 44.1%) and palpebral repair (15, 44.1%) were the most frequently performed surgical procedures on patients, followed by CGI repair (2, 5.9%). Most surgeries were performed less than 12 hours (24/34, 70.6%) after the trauma event. The longest period between admission and surgery was approximately three months, found in one orbital fracture case. Table 2 presents detailed surgical data.

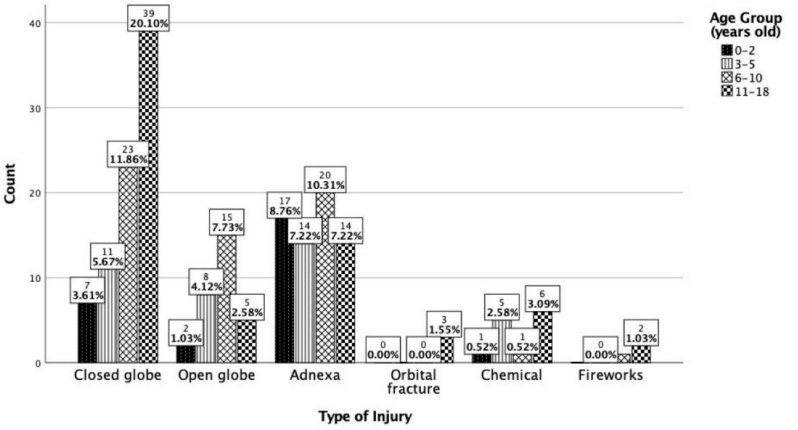

Fig. 1. Type of injury distribution based on age group.

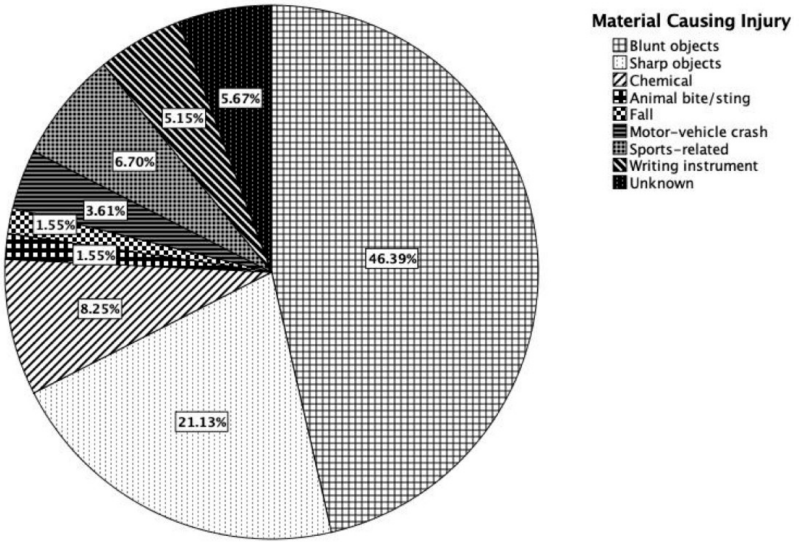

Fig. 2. Breakdown of materials that caused the injuries.

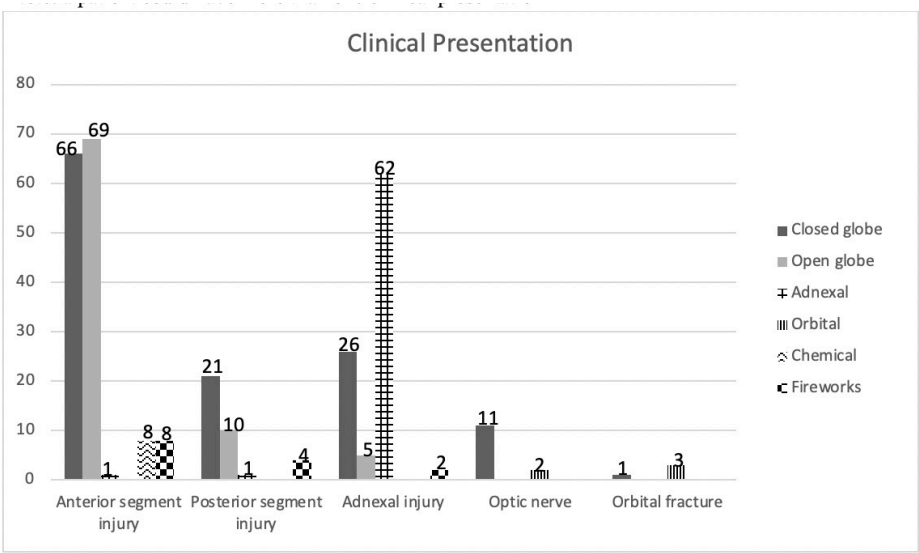

Fig. 3. Clinical presentation based on injury. ‡Note: a patient could have more than one clinical presentation.

Table 2. Type of surgery

Description	Total (n = 34, 100%)
Surgery	
Corneal repair	10 (29.5%)
Corneal-scleral repair	3 (8.9%)
Scleral repair	1 (2.9%)
Palpebral repair without canalicular involvement	9 (26.5%)
Palpebral repair with canalicular involvement	6 (17.7%)
Orbital fracture reconstruction	1 (2.9%)
ICCE	1 (2.9%)
Irrigation/aspiration hyphaema	1 (2.9%)
Vitrectomy, IOL phacoemulsification	1 (2.9%)
Symblepharon released, amnion graft, followed by anterior lamellar and cicatrix release, followed by keratoplasty	1 (2.9%)
Time from admission to surgery	
< 12 hours	24 (70.6%)
12–48 hours	5 (14.7%)
> 48 hours	5 (14.7%)

ICCE: intracapsular cataract extraction; IOL: intraocular lens

Initial VA was documented in 122 eyes (60.7%). Some data were unavailable (79, 39.3%) due to uncooperative patients, Final VA was documented for only 83 eyes. Therefore, only 78 (38.8%) eyes were included in the visual outcome analysis by combining the initial and final VA data. Mean initial VA was 0.595 ± 0.775 logMAR and final VA was 0.461 ± 0.790 logMAR ($p = 0.061$).

Compared to other injuries, most OGI patients had worse final VA (Fig. 4). We also documented 2 CGI patients who had poor visual outcomes caused by blunt trauma and fall. A strong correlation between initial VA, final VA, and type of injury was found using Spearman's correlation ($r = 0.761$, $p < 0.001$). As the outcome, 13 of 78 patients (16.7%) had severe visual impairment and/or blindness.

Univariate analysis was performed using Fisher's exact test and Pearson's chi-square test. The prognostic factors (gender, age groups, zone, time of injury, hypopyon, palpebral injury, retinal detachment, endophthalmitis, and optic nerve injury) were not statistically significant. However, other predictive factors were statistically significantly associated with visual outcomes, including initial VA ($p < 0.001$), corneal injury ($p = 0.016$), scleral injury ($p = 0.014$), iris injury ($p = 0.003$), hyphaema ($p = 0.016$), traumatic cataract ($p = 0.025$), and vitreous haemorrhage ($p = 0.031$). In multivariate analysis, initial VA ($p = 0.003$), scleral injury ($p = 0.013$), and hyphaema ($p = 0.013$) were statistically significant predictors for the visual outcome (Table 3).

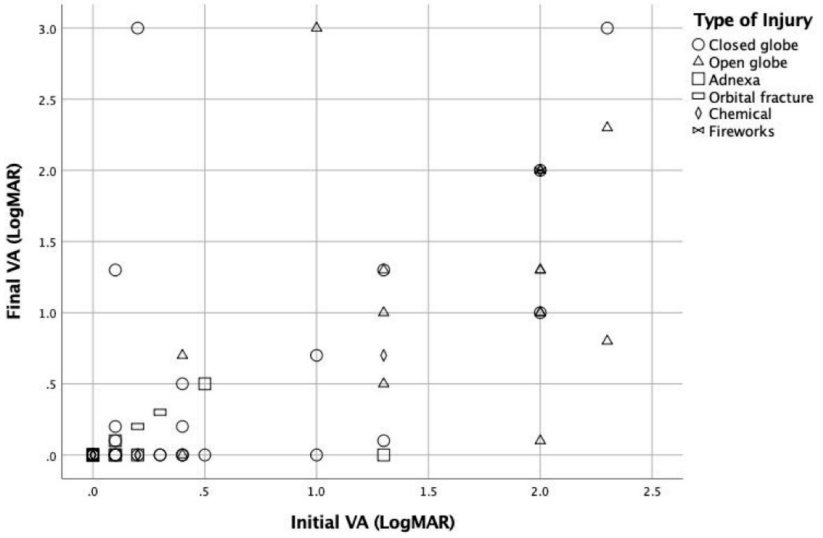

Fig. 4. Comparison of final VA and initial VA based on type of injury.

Table 3. Multivariate analysis of visual outcome predictors

Predictors for visual outcome	**Final VA**		**Odds ratio**	**95% CI**	***P*-value**
	> 3/60	**≤ 3/60**			
	***n* (%)**	***n* (%)**			
Initial VA (*n* = 78)					
Poor ≤ 3/60	10 (15.4)	10 (76.9)	38.88	3.43–440.75	0.003*
Good >3/60	55 (84.6)	3 (23.1)			
Corneal injury (*n* = 84)					
Yes	9 (12.9	6 (42.9)	0.14	0.009–2.37	0.177
No	61 (87.1)	8 (57.1)			
Scleral injury (*n* = 84)					
Yes	1 (1.4)	3 (21.4)	231.82	3.15-17052.23	0.013*
No	69 (98.6)	11 (78.6)			
Hyphaema (*n* = 84)					
Yes	6 (8.6)	5 (35.7)	16.54	1.79-152.94	0.013*
No	64 (91.4)	9 (64.3)			
Iris injury (*n* = 84)					
Yes	3 (4.3)	5 (64.3)	7.10	0.43-117.31	0.170
No	67 (95.7)	9 (35.7)			
Traumatic cataract (*n* = 84)					
Yes	7 (10.0)	5 (35.7)	0.50	0.03-6.53	0.602
No	63 (90.0)	9 (64.3)			
Vitreous haemorrhage (*n* = 84)					
Yes	2 (2.9)	3 (21.4)	1.48	0.06-36.72	0.808
No	68 (97.1)	11 (78.6)			

* Statistically significant. Data derived using binary logistic regression.

Discussion

Ophthalmic trauma is one of the leading causes of avoidable monocular blindness, and 90% of injuries are preventable.[17,18] The paediatric age group accounts for 20–59% of all ocular trauma.[18] From our findings, nearly a quarter (21.6%) of the 897 ocular trauma patients who reported to our hospital over the 10-year period were paediatric. This fact reflects how susceptible children are to trauma compared to adult patients, which is consistent with several previous studies.[3,19-21] Our findings revealed that CGI was the most prevalent type of injury, followed by adnexal injury, and OGI, while the most common setting of injury was the home.

From our findings, the most susceptible age group to ocular trauma is that between 11 and 18 years. Children aged between 11 and 18 years are at a stage of development that prepares them for adulthood. Because of their independence and lack of parental monitoring, they are more susceptible to trauma than younger children. Our results contradict those from earlier retrospective studies conducted in China[5] and Western Australia,[22] which identified children aged 0 to 2 years and 6 to 11 years as the most susceptible age groups, respectively.

Males were more susceptible than females in our study. This preponderance is consistent with previous studies.[5,14,23,24] This finding may be explained by the fact that males are more likely than females to engage in high-risk activities and to be left unsupervised. Furthermore, males are frequently more exposed to outdoor activities, including sports and activities associated with road traffic.[25]

More than 95% of the injuries in our study were unilateral, which is in line with previous studies.[11,17,26] Our findings reported CGI as the most frequent type of injury, followed by adnexal damage. This was in contrast with findings by Barry *et al.*,[11] Madan *et al.*,[26] and Cao *et al.*,[5] all of whom reported OGI as the most frequent type of injury. However, a study in Northern India showed a similar pattern to our study.[17] Since the eyelids act as the first line of protection for the eye, they are frequently injured.

Our results found that orbital fractures were related to motor vehicle accidents and blunt trauma, in line with a study by Salvin *et al.*[27] Stotland *et al.*[28] also revealed an extremely high relative frequency of orbital roof fractures occuring in males between the ages of 7 and 10. We found that our fireworks injuries found were associated with celebrations for both Eid Al Fitr and New Year's Eve. Similar patterns have been reported in other countries, also occurring as part of the celebrations throughout their festival week.[29,30] Different studies have shown that many common activities follow the patterns of each country.

The results of our study were consistent with those of Maurya *et al.*,[17] which found that blunt trauma caused more than half of all injuries, more than 95% of which were accidental. In contrast to Mac Ewen *et al.*,[4] who claimed that assaults represented 15% of injuries, only 0.5% of our patients had intentional/assault as the mechanism of injury. Syal *et al.*[31] conducted a study in India that found penetrating injuries as the

most frequent trauma in children. These differences in results might be attributed to variances in age groups, study samples, and methodology, alongside injury type and mechanism.

The setting of the injury was not documented in our data for most cases. This might be due to the children being unsupervised or unable to offer sufficient details. For the cases where setting was recorded, the most frequent in our study was the home, as was also reported in other findings.[5,32] The household environment being equally represented as sports activities, outside chores, and schools may have been a major contributing factor due to a lack of adequate adult supervision while children at home.

Eye protection use was reported during sports activities, which was consistent with prior studies from China[5] and northern India[17]. Despite the fact that eye injuries can be prevented in 90% of cases, safety procedures and the usage of eyewear protection should be followed.[33] Additionally, parental supervision also plays a vital role in paediatric ophthalmic trauma prevention.

It is well known that children take more risks than adults in terms of ophthalmic trauma. Our study found several trauma agents, causing trauma ranging from minimal to significant. Blunt objects were the most common agents of paediatric ocular trauma in our study. Ahmadi *et al.*[34] conducted a study in Iran that specifically found stationery as the most frequent traumatic agent in the paediatric population, especially school age children. Our findings also identified unusual trauma agents, including dog bites, arrows, toothbrushes, curtains, melodicas, and hats.

Chemical eye injuries can develop under a variety of conditions.[35] In our study, acid was the major contributor, but alkaline agents were used more frequently in other studies.[35] Raising awareness about household chemicals may help create a safe environment to reduce the risk of potential injury.

According to BETT,[9,10] we observed a higher proportion of Zone I injuries for both OGI and CGI, in line with previous studies.[23,26] The ratio of anterior to posterior segment involvement in our results was 6:1, which was greater than the 3:1 ratio found by Barry *et al.*[11] Our findings imply that anterior eye structures are more susceptible to trauma. A review of the clinical presentations in our study found that the most frequent CGI findings were subconjunctival haemorrhage, followed by hyphaema and corneal abrasion, in alignment with Shah *et al.*[14] Corneal rupture and iris prolapse were identified as the most common findings in OGI, and this was also emphasized in prior research in the United Kingdom,[11] India,[17] and China.[5] Even though anterior structure involvement was common in our population, this finding is still important due to poor visual outcomes.

Since most injuries involved CGI, most patients were treated conservatively with medications, whereas 16.9% of patients needed surgery. Previous studies have reported that nearly 29.7% of eyes were managed by medication and the remaining 70.3% required additional surgeries due to OGI.[5] This different pattern was discovered due to environmental and cultural differences. We found 3 cases

of endophthalmitis due to OGI, all of which presented to the hospital more than 48 hours after injury. Patients who presented within 24 hours of the trauma event had better visual results than those who did not, which was consistent with an earlier study.[36]

Regardless a strong correlation between initial VA, final VA, and type of injury ($r = 0.761$, $p < 0.001$), OGI still potentially led to poor visual outcomes, which was in line with a study by Madan *et al.*[26] In accordance with the WHO definitions of visual impairment and blindness,[16] 16.9% of children were found to have severe visual impairment and/or blindness in our study. This was lower than research from the United Kingdom indicating a higher percentage of 29.1%.[11] Our findings revealed males had poorer visual outcomes than females, as previously reported by Abbott *et al.*[25]

We found initial VA to be the strongest predictive factor of visual outcome both in univariate ($p < 0.001$) and multivariate analysis ($p = 0.003$), which several other studies have also reported.[37,38] Multivariate analysis revealed that poor initial VA resulted in a 38.88-fold chance of attaining poor visual outcomes, a larger proportion than in previous studies.[37] Our univariate analysis also demonstrated that corneal injury ($p = 0.016$), scleral injury ($p = 0.014$), iris injury ($p = 0.003$), hyphaema ($p = 0.016$), traumatic cataract ($p = 0.025$), and vitreous haemorrhage ($p = 0.031$) were related to final VA, as seen in previous studies.[37-39] Because these prognostic factors are already described by univariate analysis, corneal and scleral injuries ($p = 0.013$ each) were statistically significant as predictive factors in multivariate analysis.

The range of ophthalmic injuries may result from the diversity of cultural and socioeconomic catchment areas at our facility, a private tertiary eye hospital in Jakarta, Indonesia. It also depends on the referral system in our nation. Patients who declined treatment and surgery owing to financial and insurance concerns chose to go to other public hospitals; these findings were also clearly documented in our study. Our cohort also included patients who arrived at our hospital after having surgery at another hospital. To improve visual outcomes, particularly in children, it is necessary to strengthen the referral system, make it more efficient, and provide physicians with greater training.

A significant limitation to the present study is that the recorded ocular trauma data were obtained from a single hospital rather than from a nationwide trauma cohort. Another limitation concerns the data constraints due to its retrospective nature. Although a large number of children were involved in this study, its data may not accurately reflect the clinical and demographic ocular trauma data for the country's entire paediatric population. In order to obtain more comprehensive demographic information, multicenter or nationwide cohort research must be conducted in the future.

Conclusions

CGI, blunt trauma, and a home setting were the most common findings in our paediatric ophthalmic trauma cohort. Males and the adolescent age group comprise the majority of injured patients. Open globe injuries lead to blindness or severe visual impairment in the long term. Initial VA, scleral damage, and hyphaema were significant predictors of a poor visual outcome in our multivariate analysis. It is important to encourage parents and elderly family members to reduce hazards at home. Increasing parental awareness about medical treatment immediately after an injury should be established.

Declarations

Ethics approval and consent to participate
Ethical approval for this study was obtained from the Medical and Health Research Ethics Committee, Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada – Dr. Sardjito General Hospital with reference number KE/FK/0161/EC/2021 and complies with the tenets of the Declaration of Helsinki.

Competing interests
None to declare.

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