Original Article

Pattern of Paediatric Ocular Trauma among Patients Presenting to Civil Hospital, Karachi

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ABSTRACT

OBJECTIVE: To evaluate the frequency and epidemiological features of ocular trauma among paediatric patients.

METHODOLOGY: This prospective cross-sectional study enrolled 264 patients aged 16 years or younger, of either gender, who presented with ocular trauma to the Paediatric Eye Outpatient Department and/or Emergency Department of Civil Hospital, Karachi, between January 2023 and January 2024, after approval of the research protocol and obtaining parental consent. Detailed history, ocular examinations, and visual acuity assessments (using age-appropriate methods) were performed, along with slit-lamp and fundus examinations, as well as imaging investigations where necessary. Patients with non-traumatic ophthalmic complaints or a history of prior ocular trauma or surgical intervention for the same were excluded.

RESULTS: Among 264 children examined, 70% were boys and 30% girls, with a mean age of 7.59 ± 4.11 years. The 0–5-year age group was most affected (66%), while the 11–15-year age group was least affected (4%). Right-eye involvement predominated (66%), compared to 33% left-eye and a few bilateral cases. At presentation, 85% had visual acuity between 6/6 and 6/12, whereas 5.7% had no light perception. Most patients (78.4%) presented within 24 hours, and only 0.8% after one week. Road traffic accidents were the leading cause of injury, followed by accidents in playgrounds and at home.

CONCLUSION: Collaboration with paediatric associations is essential for introducing educational and social initiatives that highlight the seriousness of the issue and advocate for safer environments.

KEYWORDS: Visual outcomes, paediatric emergencies, ocular injury prevention, road traffic accidents, paediatric injuries, epidemiology of paediatric trauma.

INTRODUCTION

Ocular trauma in the paediatric age group is an essential cause of eye morbidity[1]. Worldwide, around 6 million episodes of ocular trauma are known to affect children under 15 years of age[2]. With reference to population-based surveys, paediatric ocular trauma causes monocular blindness in 20-50% and bilateral blindness in 3.2-5.5% [3]. Paediatric ocular trauma can fortunately be prevented in around 90% of cases[4]. Paediatric eye injuries are broadly divided into two groups 1. Open and closed globe injuries 2. Adnexal injuries. Those involving open globe injuries demand urgent attention[5]. Paediatric ocular injuries are of increasing concern as they can lead to amblyopia[6]. In open globe injuries, a substantial number of patients need hospital admission and surgical intervention[7]. Data at the local level is essential for creating awareness regarding the magnitude of the problem and for planning preventive measures[8]. Paediatric ocular trauma accounts for one third of visual loss in the first decade of life[9].

The rationale of this study is to evaluate the pattern of several types of paediatric trauma and etiological associations so that early intervention can be taken effectively to prevent vision loss. Moreover, there are fewer studies on paediatric ocular trauma in specific regions, making it essential to investigate patterns and characteristics. The results of this study can significantly contribute to guiding protocols and management strategies for paediatric ocular trauma based on pattern characteristics and demographic details.

METHODOLOGY

It is a cross-sectional prospective study. The study was conducted in the Department of Ophthalmology and Visual Sciences, Dow Medical College/Dr Ruth K.M. Pfau Civil Hospital, Karachi, following approval of the research protocol from January 2023 to January 2024. All patients meeting the inclusion and exclusion criteria are enrolled after obtaining written informed consent from their parents. Data collection was conducted using well-designed questionnaires, ensuring consistency and accuracy in the responses

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gathered. A total of 264 patients are included in this study. Sampling was done using a Consecutive Non-Probability Sampling Technique. A detailed history and ocular examination have been conducted, including age, gender, mode of injury, time and place of injury, nature of the object and extent of ocular damage. The time interval between the occurrence of the injury and presentation to the hospital is documented. Both the affected eye and the fellow eye have been examined. Injuries are classified based on whether they involve ocular adnexa, anterior segment, posterior segment, or a combination of all. They are dealt with accordingly. Anterior segment injuries are further classified based on the part of the anterior segment they damage (details are mentioned in the patient's Performa). The principal inclusion criteria were patients aged 16 years or younger, of either gender, presenting with ocular trauma to the Paediatric Eye Outpatient Department and/or the Emergency Department of Civil Hospital. In contrast, the exclusion criteria comprised patients presenting with complaints other than ocular trauma, as well as those with a previous history of ocular trauma or prior surgical intervention for the same condition.

Visual acuity is assessed based on the patient's age, as outlined below: Preverbal children: Assessment of the ability to follow and fixate a light, as well as preferential looking tests such as Teller's acuity cards, and resistance to occlusion of either eye. Verbal children: Optotypes such as Allen pictures. Older than 5 years Snellen chart (alphabet or illiterate E charts). Handheld slit lamp examination in uncooperative younger than 2 years of paediatric population, while a complete slit lamp examination is carried out for children more than 2 years of age. Children are dilated for fundus examination with Cyclopentolate topical eye drops (0.5% for those under 6 months and 1% subsequently). One drop is instilled, repeated after 5 minutes. Full dilation is achieved in approximately 30 minutes. Drops are provided from the OPD /ward free of cost. Once dilated, a posterior segment examination with an indirect ophthalmoscope is performed for all selected patients up to 5 years of age. Those older than 5 years of age undergo examination of the fundus with a 90 Dioptre lens under slit lamp bio microscope and with an indirect ophthalmoscope. X-ray, CT scan, MRI (after excluding a ferrous metallic intraocular foreign body), and B-scan ultrasonography are to be done if needed. All tests required for surgical intervention under general anaesthesia are performed on all patients who are candidates for surgical exploration or repair.

RESULTS

Among the 264 children examined, 79 (30%) were female and 185 (70%) were male. The mean age at presentation was 7.59 ± 4.11 years. The most significant proportion of patients belonged to the 0–5 year age group (175; 66%), whereas the 11–15 year age group accounted for the smallest proportion (11; 4%). The demographic characteristics of the study population are summarized in **Figure 1** below.

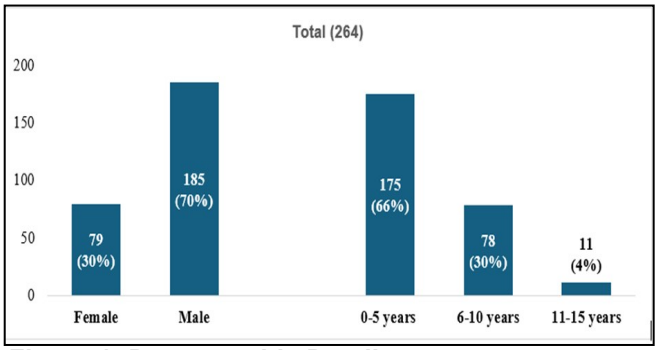

Figure 1: Demographic Details

Of the patients, 253 (96%) sustained unilateral injuries, whereas 11 (4%) had bilateral injuries. Among those with unilateral involvement, the right eye was more frequently affected than the left, as summarized in **Figure 2**.

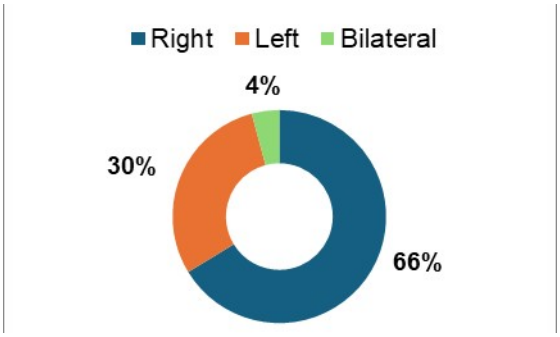

Figure 2: Eye Involved

Table I: Visual Acuity and Time of Presentation

Visual Acuity	Number	Percentage
6/6 - 6/12	225	85.2
6/18 - 6/60	12	4.5
<6/60	9	3.4
PL	15	5.7
CF	2	0.8
NA	1	0.4
Time of Presentation	**Number**	**Percentage**
<24h	207	78.4
24h - 48h	41	15.5
48h - 1week	14	5.3
>1 week	2	0.8

The majority of patients, 207 (78.4%), presented within 24 hours of injury, while only a minimal number reported after 48 hours. On presentation, the visual acuity of patients was 6/6-6/12, with 225 (85%) achieving this level. Fifteen patients with severe injuries had impaired vision, as measured of the Counting Fingers (CF) to Perception of Light (PL) ratio. In one patient, vision could be not be assessed.

Table I briefly shows the number and percentage of visual acuity and time of presentation.

In our study, 149 (56%) injuries were due to Road Traffic Accidents (RTA); hence, the place of maximum injury was also on the Road, 153 (58%). The second most common mode of injury was due to sports, and these took place either on the ground or at home. 47 (18%) patients had injuries from other modes, like being hit by an animal, bitten by a dog, bird claw injury or accidental cuts from a knife or sharp objects while playing. **Figure 3**.

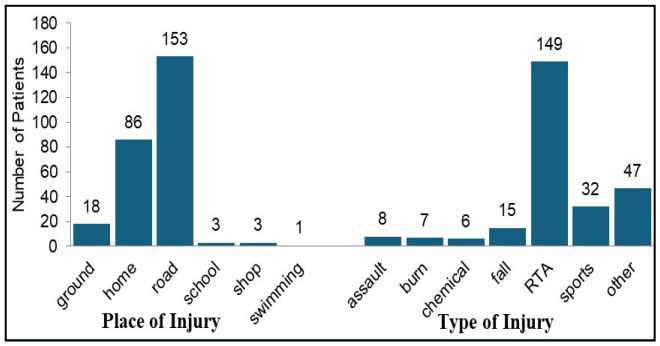

Figure 3: Place and Type of Injury

Regarding the structures involved in injuries, the anterior segment and adnexa were most commonly affected. Posterior segment was engaged in only one patient, where commotio retina (swelling in the retina secondary to blunt ocular trauma) was found. Lid swelling, edema, ecchymosis and hematoma were predominant. Those patients in whom trauma to the anterior segment was involved, like corneal injuries, scleral tears and hyphema; additionally, they had lid and adnexal involvement too. The cornea was involved in 52 patients. Corneal abrasion and oedema superseded corneal tears. Thirteen patients had lid lacerations alone, 26 had lid oedema alone, while the majority of the lid lacerations occurred along with ecchymosis and hematoma.

Along with corneal foreign body and corneal tear, a few developed other complications like hyphema, hypopyon, iridodialysis and irregular pupil. One hundred fifteen patients (43.5%) received medical treatment, 108 (41%) underwent surgical treatment, and 41 (15.5%) received conservative management. **Table II** shows different anatomical sites involved in injuries.

Table II: Anatomical sites of injuries

LID AND ADNEXA	
Lid Edema only	26
Lid laceration only	13
Lid edema + lid laceration	2
Lid laceration +ecchymosis	113
Ecchymosis only	86
ANTERIOR SEGMENT	
Cornea	52
Corneal abrasion + Corneal edema	24
Corneal Tear	10
Corneal tear + Scleral tear	2
Only Scleral Tear	2
Corneal Foreign Body	16
Sub Conjunctival Hemorrhage	31
Hypopyon + Hyphema + iris and pupil irregularities	4
POSTERIOR SEGMENT	
Commotio Retina	1

DISCUSSION

Ocular trauma is a significant cause of blindness among the paediatric population[10]. Severe ocular trauma leads to irreversible damage to ocular structure and function, which causes a substantial burden throughout the most productive years of life of children ahead[11]. Precautionary measures should be adopted early to avoid sight loss. The findings of this study emphasize the importance of targeted prevention and prompt management of mechanical paediatric eye injuries to decrease the burden of ocular trauma[12].

In this study, 70% of the 264 children examined were boys, and 30% were girls. This finding is consistent with previous literature[13-15]. Logically, this could be because boys often engage in more physical and adventurous activities compared to girls, which may increase their exposure to situations where ocular injuries are more likely to occur, such as sports or rough play. Moreover, boys may be more likely to socialize in environments where there is a higher risk of ocular trauma, such as playgrounds or sports fields, compared to girls, who may engage in more sedentary or indoor activities. Additionally, in some cultures, more importance is given to males, making their injuries more likely to be taken seriously; this point is supported by Singh S in his study[16].

40% of the children belonged to the 6 to 11 year age group, while 24% were in the 11 to 15year age group. Similar findings were reported from previous literature[17,18]. This could be explained by the fact that children between 6 and 11 years of age may begin to explore their surroundings independently, without the constant supervision of adults. This newfound independence can lead to situations where they are more susceptible to accidents, causing ocular trauma. Many children in this age group spend a significant amount of time at school, where they may engage in activities during recess or educational outings that could result in ocular injuries.

The time duration between injury and presentation was found to be less than 24 hours among the majority, which is 78.4%, similar to the study conducted by Zhang L 2014[19].

This fact, as found in the study, is well supported by the visual acuity at the time of presentation, which was 6/6 to 6/12 in 85% of cases and less than 6/60 in

3.4% of cases. Prompt medical attention can lead to early assessment and treatment of ocular injuries, thereby minimizing the extent of damage and optimizing the chances of preserving vision. Early diagnosis enables immediate interventions, such as irrigation, wound exploration, and medication administration, to prevent complications. Swift medical care can help in preserving the function of ocular structures by addressing injuries before irreversible damage occurs. Suturing lacerations, repairing corneal or scleral injuries, or stabilizing intraocular pressure can improve the prognosis for visual recovery. Contrary to our study, a study conducted by Ahmed Zeeshan Jamil in Sahiwal reported that 35.4% of children had visual acuity of 6/12 or better, while 39.9 % presented with 6/60 or less[20].

The visual acuity of the majority of children in our study was 6/12 or better. Most of the injuries involved the lid and adnexa, followed by the anterior segment. The majority of injuries involving the lid and adnexa spare the visual axis and, therefore, do not affect visual acuity at presentation. This is also confirmed in a previous study conducted by Rahul Prasad[21] in India, who found that the majority of cases involved the lid adnexa (52%). In his research, most of the patients (68%) presented with visual acuity of 6/18 or better. One reasonable explanation for the correlation between the site of injury and visual outcome is that lid injuries can trigger protective reflexes in children, such as closing the eye tightly, which can shield the eye from further damage. Also, lid injuries are often more apparent and conspicuous, leading to earlier medical attention and intervention, which can prevent secondary complications and promote better visual outcomes.

The majority of children presented with injuries involving one eye only, predominantly the right eye (66%), followed by the left eye (30%). In comparison, both eyes were involved in only 4% of cases. This contrasts with the findings reported by Maurya RP et al[22], who reported left eye involvement in 52.5%, right eye involvement in 40.2% and both eyes involved in 7.4% of children. The dominance of right or left eye involvement in ocular trauma among children can vary due to several factors, including behavioural tendencies and environmental factors. Additionally, sample size and random chance may also contribute to the observed differences between studies.

In our study, the majority of ocular injuries occurred on the Road (58%). The second most common site reported was either a playground or a home. This contrasts with the findings observed in the UK Paediatric Ocular Trauma Study (POTS 2). According to this study, the majority of the events occurred at home (50%) and 25% in school or nursery[23]. The variance in the locations of paediatric ocular trauma between studies conducted in Pakistan and the UK can be attributed to several factors, including cultural, environmental, and socioeconomic differences between the two regions. In Pakistan, where road injuries are more prevalent, factors such as traffic congestion, lack of road safety measures, and possibly higher rates of outdoor activities could contribute to the higher incidence of ocular trauma on roads. Conversely, in the UK, where injuries at home are more common, factors such as home safety practices, child supervision levels, and the prevalence of household hazards might play a more significant role in ocular injuries occurring within the home environment. Understanding these contextual differences is crucial for implementing targeted preventive strategies in each setting.

The majority of the patients presented to us were having injuries involving the lid and adnexa, followed by the anterior segment. The posterior segment was rarely involved. Similar results were obtained in the study conducted in India[24]. In paediatric ocular trauma, involvement of the ocular adnexa (eyelids, lacrimal system) and anterior segment (cornea, iris, lens) is more common than the posterior segment (vitreous, retina, choroid). This is primarily because children are more prone to activities and environments where they are at risk of blunt trauma, such as falls, sports-related injuries, or accidents during play. These types of trauma often affect the front of the eye and surrounding structures due to their exposed nature and proximity to the impact. Therefore, ocular trauma in children typically manifests with injuries to the ocular adnexa and anterior segment rather than the posterior segment.

In this study, the majority of patients (43.5%) received medical intervention, followed by those who required surgical intervention (41%), 15.5% patients were managed conservatively. In a study conducted in India, individuals with open globe injuries required more surgical intervention. Closed globe injuries were managed surgically or medically. To address the widespread and avoidable strain on patients and the economy caused by close globe injury, cost-effective public health approaches should focus on vulnerable age groups[25]. Precautionary measures such as keeping sharp objects, chemicals, and firecrackers out of children's reach are crucial in preventing ocular injuries. The use of sport-specific protective eyewear is essential for children engaged in physical activities. At the same time, helmets during motorcycle riding play a vital role in reducing the risk of ocular trauma in road traffic accidents. Additional preventive strategies include ensuring adequate supervision of children during play, promoting safe storage of household tools and gardening equipment, discouraging unsupervised use of BB guns, pellet guns, or other projectile toys, encouraging seat belt use in vehicles to prevent injury from sudden impact, and implementing community awareness programs to educate parents and caregivers about ocular safety[12].

CONCLUSION

Paediatric eye injury rates and severity have remained unchanged over the last 25 years, highlighting the

importance for eye-care providers to be proficient in assessing and treating severe paediatric eye trauma in emergencies.

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Ethical Permission: Dow University of Health Sciences, Karachi, Pakistan, IRB approval letter No. irb-2804/DUHS/Approval/2022/34.

Patient Consent: Consent was taken from the parents/guardians of the children, as all of them were minors.

Conflict of interest: There is no conflict of interest between the authors.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Mirza AA: Literature search, study design, data collection, data analysis, data interpretation, drafting, editing of data
UL Hasan M: Literature search, data collection, data interpretation, editing of data
Al Khairy S: Literature search, study design, questionnaire, data collection
Ismail A: Literature search, study design, questionnaire, data collection, data analysis, data interpretation, drafting
Farooq F: Literature search, data collection, data interpretation
Haroon H: Literature search, data collection

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