

## Pattern of pediatric ocular trauma in a Eastern Uttar Pradesh

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### Abstract

**Introduction:** Eye injuries are important leading cause of acquired unilateral blindness in paediatric age group. The burden and pattern of ocular trauma in Northern India are poorly known. The aim of this study was to assess the epidemiological characteristics, profile of trauma, clinical presentation and visual outcome in study subjects.

**Materials and Methods:** Present hospital based, observational study was conducted over a period of three years at the Sir Sunderlal Hospital, Institute of Medical Science, Banaras Hindu University, Uttar Pradesh, India. This study includes patients who are  $\leq 15$  years of age fulfilling the various inclusion and exclusion criteria. All the patients underwent for detailed workup according to the protocol. The follow-up period was about 6 months. Data regarding demographic profile, injury profile, clinical presentation, treatment outcomes and prognostic factors were analysed.

**Results:** Out of 402 total cases of ocular trauma meeting inclusion and exclusion criteria, 122 children  $\leq 15$  years of age were found as subjects for this study for which there were 77 (63.1%) boys and 45 (36.9%) girls. The ocular trauma was more prevalent (43.4%) in the age group of 11-15 years followed by 6-10 years of age group (36.9%). 84.4% of them were Hindu and 14.8% were Muslim. Majority (48.4%) of them belonged to rural background. The highest proportion of injuries occurred at home (48.4%) followed by school premises and playground (19.7% each). Maximum injury occurred during summer season (42.6%). Commonest non-occupational injury was sports related (58.2%) followed by domestic accidents (27%). Most common source of mechanical injury was vegetative materials / wooden objects (31.1%) followed by stone/brick (15.6%) and metallic objects (13.1%). Commonest non mechanical injury was cracker burn (10.66%). Only left eye was affected in 52.5%, right eye 40.2% while 7.4% had bilateral injury. 79.5% had isolated ocular injury rest had poly-trauma whereas out these, 49 (40.2%) & 42 (34.4%) were blunt object and sharp object. Of 131 injured eye 70 (53.4%) eyes had open globe injury. Most of the open globe injuries were in Zone-I (27.87%). 16 (13.1%) presented to hospital > 24 hours after injury. 54.10% were managed surgically and rest 41.80% were managed by conservative treatment. 65.6% children reported clinical improvement and 4.9% deteriorated while 24.6% were dropout cases.

**Conclusions:** Children are more susceptible to ocular trauma. Male gender, teen age and rural background were determinants, associated with paediatric ocular trauma. Lack of regular follow-up indicates that need of awareness to be created among the parents, care takers and teachers. A safe environment should be maintained for children.

**Keywords:** Blunt trauma, Ocular trauma Open globe injury, Paediatric injury

### Introduction

Eye injuries are important cause of ocular morbidity in children being leading cause of acquired unilateral blindness in paediatric age group. A study conducted on paediatric firearm injury observed that eye injuries account for approximately 8-14% of total injuries in children.<sup>(1)</sup> Studies from London and South Croatia reported that eye trauma constitutes 7% of all bodily injuries and 10-15% of all eye diseases.<sup>(2,3)</sup> There are approximately 1.6 million blind people due to ocular trauma, 2.3 million being bilaterally visually impaired worldwide.<sup>(4,5)</sup> Study from New Delhi reported that 1.5% of total blind were due to ocular injury.<sup>(6)</sup> Approximately half of all patients attending an eye causality department present with ocular trauma.<sup>(7)</sup> According to a study conducted in South Croatia reported that children account for 12.5- 33.7% of all admissions for eye injuries.<sup>(3)</sup> Paediatric eye injuries have special concern because it is prone to amblyopia.<sup>(8,9)</sup> Ocular trauma in children is mainly related to sports and recreational

activity.<sup>(10,11)</sup> Ocular trauma has significant impact on individual, involving family and society in terms of socioeconomic cost, morbidities, unnecessary toll on medical care, long-term disability, productivity loss, thereby affecting the quality of life. The adverse consequences of ocular injuries like visual impairment and permanent physical disfigurement can also isolate the patient socially, imposing a physical and psychological barrier.<sup>(12)</sup> It has been estimated that 90% of all ocular injuries are preventable with protective devices like safety glasses and goggles, helmet, seat belt, eye shield and face masks etc.<sup>(13)</sup> There were 2-3% of all eye injuries require hospital admission.<sup>(14)</sup> Aim of this study was to assess the epidemiological characteristics, pattern of clinical presentation and to find out the visual outcome.

### Materials and Methods

This hospital based, observational study was conducted at Department of Ophthalmology, Sir

Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University Varanasi, Uttar Pradesh, India. The SS Hospital is patronized by patients from eastern Uttar Pradesh, Bihar, Jharkhand, Chhatisgarh, Madhya Pradesh and part of Nepal. The present study was conducted over a period of three years from September 2011 to August 2014. All children up to 15 years of age with history of acute injury were included. Approval of Institute Ethical Committee was obtained prior to commencement of this study. Informed, written consent was obtained from the patient's parents or attendants.

**Setting:** Cases presenting with acute ocular trauma in OPD of Department of Ophthalmology and emergency services of SS Hospital were registered.

**Sample size:** 122 patients of acute ocular trauma  $\leq 15$  years were studied.

**Inclusion criteria:** All patients  $\leq 15$  years ages with acute ocular trauma attending first time and giving consent were considered as study subjects.

**Exclusion criteria:** Subjects who had superficial foreign body, injury in atrophic or blind eye, received surgical repair elsewhere, who had old ocular trauma ( $>1$  month), subjects with co-existing vision threatening ocular morbidities, follow-up period  $< 6$  months and unwilling or comatose/ unconscious patients were not included in the study.

The respondents were interviewed with the aid of structured, predesigned and pretested proforma by interviewer. Information regarding demographic characteristics i.e., child age, sex, residence, caste, education level, per-capita income and details of injury of patients viz., specific history of trauma include date, time, place, and season of injury types & characteristics of traumatic agent, circumstances of injury, mode of injury were collected. Health seeking behaviour like referral pattern, time elapsed between injury and treatment and previous treatment were also enquired.

All patients underwent a comprehensive ocular examination i.e., site of injury, type and extent of injury, initial best corrected visual acuity examined by Snellen chart, illiterate charts, naming picture or matching letters for young children, examination of anterior segment, intraocular pressure measurement using in only closed globe injury; examination with direct ophthalmoscopy and or indirect ophthalmoscopy; bio microscopy with 20 and 78 diopter lenses. Radiological investigation like ultrasonography bio microscopy, USG, CT scan and MRI were also done as per requirement and clinical findings i.e., laceration, hyphaema, iris injury, afferent pupillary defect, lens injury, presence or absence of vitreous/retinal detachment or retinal break, macular hole, choroidal rupture, presence of retained intraocular foreign body. Diagnosis and treatment either medical or surgical were recorded and followed-up for six months after injury with final visual acuity recorded.

Statistical analysis was done using SPSS version 18.0. Descriptive analysis was used in the form of

frequency, percentage, mean and Standard Deviation (SD). Chi-square ( $\chi^2$ ) test was used for significant association.

## Results

Socio-demographic profile of the subjects is given in Table 1. Out of 122 subjects, 19.7% subjects belonged to 0-5 years age group whereas 6-10 and 11-15 years age groups constituted 36.9% and 43.4% respectively. As far as religion, was concerned 84.45% subjects were Hindu and 14.8% subjects were Muslim. In all, subjects belonging to SC/ST, OBC and Other Caste categories were 9.8%, 50.8% and 39.3% respectively. Out of all, maximum 30.3% subjects belonged to rural area, whereas the proportion of subjects belonging to urban and semi-urban area were 21.3% and 30.3% respectively.

**Table 1: Distribution of study subjects according to socio-demographic profile**

Characteristics	Number (n= 122)	Percentage (%)
Age		
0-5	24	19.7
6-10	45	36.9
11-15	53	43.4
Sex		
Male	77	63.1
Female	45	36.9
Cast		
SC/ ST	12	9.8
OBC	62	50.8
Others	48	39.4
Religion		
Hindu	103	84.4
Muslim	18	14.8
Others	1	0.8
Residence		
Urban	26	21.3
Semi-urban	37	30.3
Rural	59	48.4

Injury profile of the study subjects is given in Table 2. Maximum (54.9%) subjects time of injury was 18.00-23.59 hours. As far as place of injury was concerned it was observed that majority (48.4%) of the injury occurred at home followed by playground (19.7%), school (19.7%), workplace (3.31%) and miscellaneous (1.6%). Maximum (42.6%) injury occurred during summer season, whereas 34.4% and 23.0% injuries occurred during rainy and winter season, respectively. In all, mechanical injury (82.8%) was more common type of injury. Of all traumatic agents maximum (40.2%) were blunt followed by sharp (34.4%) and indeterminate (25.4%). Nearly  $\frac{3}{4}$  (76.1%) of traumatic agents were solid and 54.0% injury was caused due to projectile objects.

**Table 2: Injury profile of the study subjects**

Characteristics	Number (n= 122)	Percentage (%)
Time of injury		
06.00-11.59 hr	27	22.1
12.00-17.59 hr	67	54.9
18.00-23.59 hr	27	22.1
00.00-05.59 hr	01	08
Place of Injury		
Home	59	48.4
School	24	19.7
Playground	24	19.7
Work Place	04	3.3
Miscellaneous	02	1.6
Season		
Summer	52	42.6
Rainy	42	34.4
Winter	28	23.0
Type of Injury		
Mechanical Injury	101	82.8
Non-mechanical Injury	21	17.2
Type of Traumatic Agents		
Blunt	49	40.2
Sharp	42	34.4
Indeterminate	31	25.4
Characteristics of Traumatic agents		
Solid	93	76.1
Fluid	05	4.1
Gel	02	1.6
Particulate	09	7.4
Indeterminate	12	9.8
Mode of Injury		
Projectile Object	66	54.0
Fall	22	18.0
Collision with person/ object	14	11.5
Blast/ Fire work	14	11.5
Injury by animal/ insect	03	2.5
Miscellaneous	03	2.5

Bimodal seasonal trend was observed with first peak between May to June and second between September to October (Fig. 1). Table 3 shows the distribution of Non occupational injury. Most common cause of injury was sports & recreational activities (58.2%) followed by domestic accident (27.0%) and road traffic accidents (5.7%). 50.0% domestic accident and 57.1% RTA occurred in 11-15 years age group. Table 4 shows the distribution of age versus number of body structures injured. About 79.5% victims sustained a single injury/ isolated ocular involvement and rest 20.5% sustained injury of two or more than two body organs / poly-trauma. Isolated ocular injury was observed mainly in 0-5 year (20.6%) and 6-10 years age group (39.2%) while as in 11-15 years age group most of the victims had two organ (57.8%) or more than two (50.0%) organ involvement. 17.2% had non-mechanical injury. Commonest non-mechanical (Fig. 2) injury was cracker burn (10.7%) followed by alkali burn (4.10%). The right eye was involved in 49 (40.2%) subjects, the left eye in 64 (52.5%) cases and the injury was bilateral in 9 (7.4%) cases. Maximum bilateral injury was observed in 6-10 years (55.5%) and 11-15 years (44.4%) age group (Table 5). Ocular adnexae (lid & orbit) were involved in 64.9% cases (Fig. 3-5). Out of 131 injured eye, 53.4% had open globe injury (Fig. 6) while 18.3% had closed globe injury. Open globe injury was more common in left eye (35.1%). Most of the open globe injuries were zone I (27.87%). About 54.10% were managed surgically and rest were managed by conservative treatment, where as assessing visual acuity subjects were categorized in three category viz., good vision (<6/18-6/60), visual impairment (< 6/18-6/60) and blindness (< 6/60 – No PL). Upon initial presentation in right eye 6.9%, 25.9% and 41.4% had good, impaired and blind/ no vision respectively corresponding values for left eye were 16.4%, 6.8% and 53.4%. Assessment of visual acuity on initial visit was not possible in 25.9% cases in right eye and 23.4% cases in left eye. After six months vision in right eye was good in 34.5%, impaired in 22.4% and blind in 15.5%. After six month vision in left eye was good in 21.9%, 26.1% and 28.7% (Table 6). Six month after treatment 65.6% of victim had improvement, 4.9% were unchanged, 4.9% were deteriorated while 24.6% were absent from last follow-up.

**Table 3: Distribution of Age vs Non Occupational Injury**

Age	Non Occupational Injury											
	N/a		Sports & Play		RTA		Assault		Domestic Accident		Miscellaneous	
	No	%	No	%	No	%	No	%	No	%	No	%
0-5	0	0.00	19	26.39	0	0.00	0	0.00	5	15.63	0	0.00
6-10	1	50.00	26	36.11	3	42.86	0	0.00	11	34.38	4	57.14
11-15	1	50.00	27	37.50	4	57.14	2	100.0	16	50.00	3	42.86
Total	2	100	72	100	7	100	2	100	32	100	7	100
Test of significance	$\chi^2 = 65.744$ , df = 65, p > 0.05											

**Table 4: Distribution of Age vs Total number of Body organ involved**

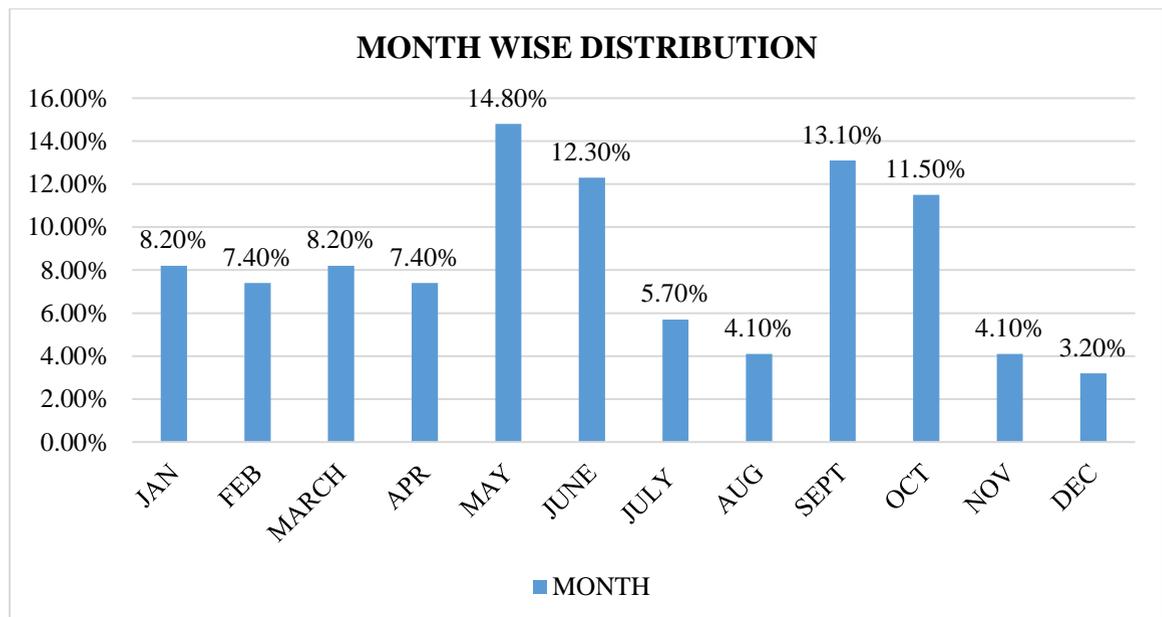
Age	Total number of Body organ involved					
	1		2		≥ 3	
	No	%	No	%	No	%
0-5	20	20.62	3	15.79	1	16.67
6-10	38	39.18	5	26.32	2	33.33
11-15	39	40.21	11	57.89	3	50.00
Total	97	100	19	100	6	100
Test of significance	$\chi^2 = 21.522, df = 26, p > 0.05$					

**Table 5: Distribution of Age vs Eye Effected**

Age	Eye Effected					
	RE		LE		BE	
	No	%	No	%	No	%
0-5	10	20.41	14	21.88	0	0.00
6-10	20	40.82	20	31.25	5	55.56
11-15	19	38.78	30	46.88	4	44.44
Total	49	100	64	100	9	100
Test of significance	$\chi^2 = 32.794, df = 26, p > 0.05$					

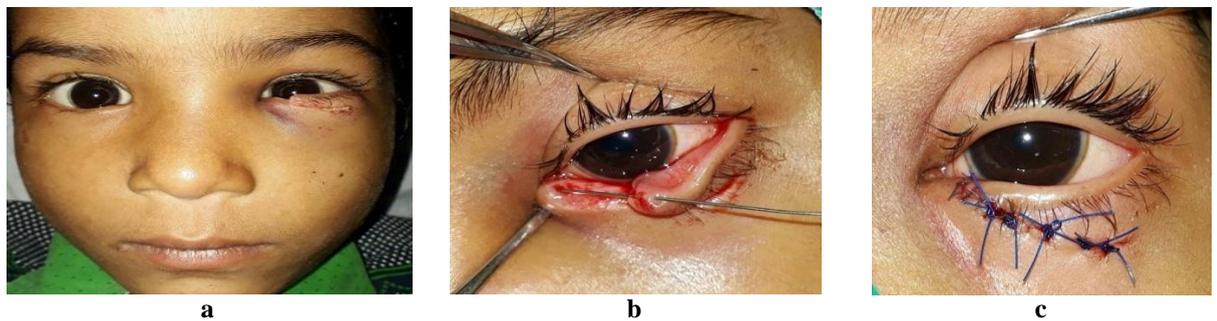
**Table 6: Distribution according to Visual Acuity**

Visual Acuity	Initial Grade of Visual Acuity				Visual Acuity after 6 weeks			
	Right Eye (N=58)		Left Eye (N=73)		Right Eye (N=58)		Left Eye (N=73)	
	No	%	No	%	No	%	No	%
≥ 6/12	4	6.9	12	16.4	20	34.5	16	21.9
6/18-6/60	15	25.9	5	6.8	13	22.4	19	26.1
< 6/60-No PL	24	41.4	39	53.4	09	15.5	21	28.7
Could not be Assessed	15	25.9	17	23.4	16	27.6	17	23.3

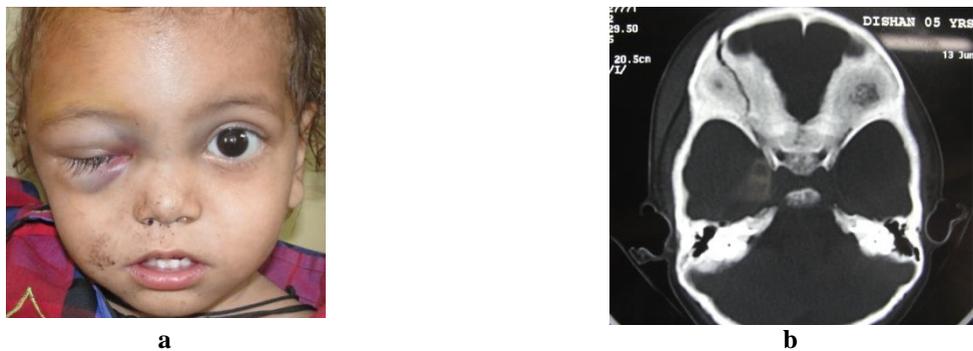
**Fig. 1: Month wise Distribution of study subjects**



**Fig. 2: Non mechanical injuries: (A) Young male child who sustained superficial thermal/ flame burn. (B) Both eye periorbital cracker burn. (C) Young male child who sustained superficial thermal burns by hot milk over forehead and periorbital area with interrupted sutures over left brow area**



**Fig. 3: (A) Young female child having left lower eyelid canalicular laceration due to fall on bucket. (B & C) Canalicular repair was done**



**Fig. 4: (A). Male child showing right orbito-facial contusion and orbital hematoma due Fall from Roof (B). Bone window of a CT scan section at the level of orbital roof shows a fracture line through the right orbital roof**



**Fig. 5: (A) Male child having Right blow out fracture (floor orbit) due to fall from bicycle showing periocular abrasion and Ecchymosis. (B) 3D volume rendered image of CT scan shows fracture involving the floor & rim of right orbit**



**Fig. 6: (A) A male child who sustained injury from wooden stick leading to left eye corneoscleral tear with uveal tissue prolapsed. (B) Postoperative photograph**

### Discussion

Ocular trauma is an important reason for childhood visual disability and blindness. Distinguish number of studies have been published on ocular trauma in paediatric age group.<sup>(1,8,15)</sup> In present study 30.35% injuries occurred in children of  $\leq 15$  years. Bukhari et al in a study in Pakistan found that ocular injuries account for approximately 8-14% of total injuries suffered by children.<sup>(16)</sup> Desai et al found in a survey of total of 415 patients of Scottish origin admitted to hospital for ocular injury and of these 93(22%) were children below 15 years age.<sup>(17)</sup> Prevalence of ocular injuries was found to be 8.1% in a study conducted by Dulal et al in Nepal.<sup>(18)</sup>

This study showed male predominance with male: female ratio being 1.7:1 similar to this finding other workers.<sup>(20-23)</sup> also reported higher proportion of male subjects in comparison to female subjects. The reason for this can be explained to the adventurous and aggressive nature of boys and males are allowed to go outside more than girls.

In this study low prevalence of ocular trauma (19.7%) was observed in preschool children (0-5 years) as compared to older children 11- 15 year age group (43.4%) and 6-10 year age group (36.9%). This because of children 0-5 years are most of the time under close parental supervision and they are physically less active than older children. Dulalet al reported maximum incidence in age group 5-10 years (38.1%) and 10-15 years (16.6%).<sup>(10)</sup> El-Sebaity et al reported maximum injury (50.7%) occurred in children aged 2-7 years followed by those aged 7- < 12 years (36%) and lowest (13.3%) in children aged 12-16 years.<sup>(23)</sup> The reason for this can be explained that younger children's are relatively immature, have lack of coordination and limited ability to avoid or escape from danger. It has been reported that the place of injury varies according to age. Present study revealed maximum injury in 0-5 year age group occurred in home (70.8%), in 6- 10 year age group occurred in home (45.2%) and school (24.4%) and in age 11-15 year age group maximum injury occurred in home, (41.5%) followed by playground (28.3%) and school (18.8%). This difference is because of younger

children usually spending more time at home while older children commonly involved in unsupervised activities outside home. Several other reported home as the commonest place of injury (Thompson et al, 58%, Luff et al 34%, Kuhn et al 43% and MacEwen et al (15.0%).<sup>(24-27)</sup>

The bimodal pattern of seasonal distribution was found with first peak in May and June and second peak in September and October. Incidence was minimum in November and December (winter). The Similar finding was reported by several authors.<sup>(11,27,28)</sup> Study from Ireland reported high incidence of ocular trauma in winter season.<sup>(29)</sup> Above pattern is because in summer season schools are closed and students are involved in outdoor games. Incidence of ocular injury was least in winter due to cold climate which restrict the mobility. Most common cause of injury was sports & recreational activities (n=71, 58.2%) followed by domestic accident (n= 33, 27.0%) and road traffic accidents (n=7, 5.7%). High incidence of sport related injuries were reported by Al-Bdour (74.1%),<sup>(30)</sup> Sechein et al (34%),<sup>(31)</sup> Blomdahl et al (23%).<sup>(32)</sup> In contrast to above findings Luff et al (15%),<sup>(25)</sup> Kuhn et al (13%)<sup>(26)</sup> reported low incidence of sports related injury.

In this study, blunt injuries predominate (40.2%). In only 34.4% were injured by sharp objects. Our study concurs with Mac Ewen et al<sup>(27)</sup> who reported higher incidence of blunt trauma. In contrast to this study Kaur et al<sup>(33)</sup> reported 73.67% and Krishnan et al<sup>(34)</sup> reported 69.20% penetrating injuries.

### Conclusion

Prevalence of ocular trauma is much higher in paediatric age group. Ocular trauma leads to diminution of vision, cosmetic blemish and personality defects. The study emphasizes the need to create health education and awareness among the parents, elders, teachers and care takers about the hazardous games, safety measures and ocular morbidity caused by delayed presentation.

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