Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

Study of epidemiology, clinical profile, visual outcome and prognostic factors of blunt ocular trauma in a teaching hospital

Rajendra Prakash Maurya, Virendra Pratap Singh[1], Swati Gautam[1], Asha[1], Anil Kumar[2], C. P Mishra[3], P Jain[4], Anjali Singh[5,*], Shivangi Singh[6], Syeed Mehbub Ul Kadir[7], Farzad Pakdel[8], Ekagrata Shukla[1], Amit Patel[1]

[1]*Regional Institute of Ophthalmology, Institute of Medical Sciences, Banaras Hindu University,, Varanasi, Uttar Pradesh, India*
[2]*Dept. of Statistic, Faculty of Science, Mahatma Gandhi Kashi Vidyapeeth, Varanasi, Uttar Pradesh, India*
[3]*Dept. of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India*
[4]*Dept. of Plastic Surgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India*
[5]*Autonomous State Medical College, Bahraich, Uttar Pradesh, India*
[6]*Dept. of Ophthalmology, Moti Lal Nehru Medical College, Prayagraj, Uttar Pradesh, India*
[7]*Sheikh Fazilatunnesa Mujib Eye Hospital and Training Institute, Gopalganj, Bangladesh*
[8]*Dept. of Oculo-Facial Plastic Surgery, Tehran University of Medical Sciences, Tehran, Iran*

ARTICLE INFO

Article history:
Received 12-11-2022
Accepted 18-11-2022
Available online 29-12-2022

Keywords:
Blunt ocular trauma
Hyphema
Globe rupture
Lens dislocation
Ocular trauma score

ABSTRACT

Purpose: To describe the epidemiology, patterns of ocular trauma, clinical presentation, visual outcome and prognostic factors of blunt ocular trauma.

Materials and Methods: A teaching hospital based prospective observational study was conducted over a period of 4 years from March 2012 to Feb 2016. 226 patients of all age group fulfilling the various inclusion and exclusion criteria were included in the study. All patients underwent detailed protocol based workup including a comprehensive ocular examination along with relevant radiological tests. Data regarding demographic profile, etiology, circumstances of the injury, traumatic agents, mode and mechanism of injury, extent and severity of injury, clinical features, management and visual outcome was analyzed and prognostic factors including ocular trauma score were evaluated.

Results: Out of 402 total cases of ocular trauma, 226 caused by blunt objects were included in this study. 181 (80.1%) were male rest 45(19.9%) were female. The mean age was 42.6 ± 18.8 years. Blunt trauma was more prevalent in age group 16-25yrs (24.3%) followed by 26-35 years (23.9%). Majority (68.6%) of victims belonged to rural background. Most of the patients sustained trauma at road /street (30.5%) and home (27.9%). The most common cause of blunt trauma was road traffic accident (26.5%) followed by sports related injury (22.6%) and physical assault (21.7%). The most frequent traumatic agent was wooden object (26.0%) followed by stone / brick (25.2%) and metallic object (23.1%). Only 32.3% of patients had isolated ocular injuries, rest had associated polytrauma. 93.3% victims had unilateral ocular injury. Left eye (52.3%) was predominantly involved. Majority of injured eyes had more than 3 ocular structure involvement. Out of 241 injured eye 14.0% eyes had only globe injury while 61.4% eyes had simultaneous globe and adnexal injuries. 55.6% eyes had closed globe injury while 19.9% eyes had globe rupture. 20.7% eyes had purely posterior segment injury, while 23.2% eyes had both anterior and posterior segment injury. Most common clinical finding was corneal abrasion (45.6% eyes) followed by hyphema (44.0% eyes), traumatic mydriasis (35.7%), vitreous hemorrhage (33.2%) retinal detachment (20.3%), lens dislocation (22.8%) and traumatic cataract (17.4%). At the time of initial presentation 33.2% eyes had visual impairment and 35.7% eyes had blindness. 14.5% eyes with closed globe injury and 5.0% eyes with open globe injury had zone III injury. Ocular trauma score was in Category I in 14.9% injured eyes and in category II in 7.1% eyes. After 6 months 14.5% of the right eye and 24.2% of the left eye showed blinding outcome.

Conclusion: Blunt trauma is the commonest mode of ocular injury. Young adult males are more vulnerable. Intraocular hemorrhage, zone III injury, posterior segment involvement and low ocular trauma score are poor prognostic factors.

https://doi.org/10.18231/j.ijceo.2022.094

1. Introduction

Ocular trauma is a leading cause of avoidable monocular blindness and visual impairment worldwide.[1] The incidence and prevalence of ocular trauma vary based on geographical location, climate and societal factors. Approximately 1.6 million people worldwide are blind due to ocular trauma, 2.3 million being bilaterally visually impaired and 19 million have unilateral loss of vision.[2,3] The reported incidence of ocular trauma in India varies from 1% to 5%.[4,5] 5% of all ophthalmic hospitalisation in the developed countries are due to ocular trauma and this figure is much higher in developing countries.[6] Despite its public health importance, ocular trauma is most neglected and under-reported disorder.

Severity and extent of ocular injury is determined by the amount of energy transferred to the globe & orbit, characteristic of traumatic agent and location of impact area. Blunt trauma is the commonest form (54.9%) of ocular injury.[7] Blunt trauma can occur in almost any setting and circumstances including workplace / domestic accidents, road traffic accidents, sports & recreational activities and physical assaults etc.[8]

The most common traumatic agent causing blunt ocular trauma are cricket ball, squash ball, fist, bamboo /wooden stick, airbag, cow horn and other projectile objects like stone, brick & Gulli etc.[9,10] The spectrum of blunt ocular injuries ranges from mild non-sight threatening injuries like ecchymosis of eye lid, corneal abrasion, sub-conjunctival haemorrhage to extremely serious blinding consequences such as globe rupture, retinal detachment, intraocular haemorrhage, traumatic optic neuropathy and orbital haemorrhage etc.

Blunt ocular trauma can cause damage of ocular tissue by the coup and countercoup mechanism and anteroposterior compression or horizontal tissue expansion. Coup injury occur at the site of impact (e.g. ecchymosis of lid, sub-conjunctival haemorrhage and corneal abrasion etc). Counter-coup refers to injuries at the opposite side of site of impact like commotio retinae.[11]

Blunt trauma causes various effects in anterior and posterior segment of the eyeball and its adnexa [eyelid, orbit, conjunctiva]. In this hospital based, observational study we analyze the demographic profile, injury pattern, clinical presentation, visual outcome and prognostic factors of blunt ocular trauma.

2. Materials and Methods

This was a prospective, hospital based, observational study conducted at the outpatient Department of Ophthalmology and Emergency Services, Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University Varanasi, Uttar Pradesh, India. The present study was conducted over a period of four years from March 2012 to February 2016. Out of 402 patients having ocular trauma 226 patients with a definite history of recent blunt trauma to the eyeball and ocular adnexa who were visiting for the first time and willing to give consent were included in the study. Patient with the history of penetrating ocular injury, non-mechanical ocular trauma, old ocular injuries (>1 month), patients operated elsewhere, having pre-existing vision threatening ocular co-morbidity, injury in phthisical eye and patients who were not willing to give consent were excluded from the study.

After getting ethical clearance from research Ethical Committee of Institute of Medical Sciences, Banaras Hindu University Varanasi, Uttar Pradesh and informed, written consent all study subjects underwent detailed history and ocular & systemic examination. A detailed history regarding demographic information such as age, sex, residential area, marital status, occupation and educational status of the patient and specific history of trauma including date, time, place, and mode of injury, circumstances of injury, characteristics of traumatic agent and condition of the victim at the time of injury and information about protective measures taken at the time of injury were recorded.

All patients underwent detailed ocular examination including initial visual acuity assessment, anterior segment evaluation with diffuse torch light and slit lamp examination, gonioscopy (if possible), intraocular pressure measurement (only in closed globe injury) and posterior segment examination with direct ophthalmoscopy and or indirect ophthalmoscopy to assess type, extent and severity of injury and structural and functional loss was noted. Investigation like OCT, X-ray orbit, ultrasonography (USG B Scan), CT scan and MRI were done as per indication.

All patients were managed according to the injury and close follow up was done to assess the treatment outcome / complications. All the information was collected in a predesigned and pretested performa.

3. Results

Blunt injury is the most frequently observed mode of ocular trauma, in our study, out of 402 patients having ocular trauma, 226 had definite history of recent blunt trauma to the eye. Thus, in our study the extent of blunt mode of ocular trauma was 56.2%.

3.1. Demographic profile

Socio-demographic profile of the study subjects is given in Table 1. Out of 226 patients of blunt ocular trauma 181 (80.1%) were males and 45 (19.9%) were females with a male female ratio of 4:1. The mean age was 42.6 ± 18.8 years. The youngest patient was 2 years old and the oldest

* *Corresponding author*.
E-mail address: anjulsingh30@gmail.com (A. Singh).

was of 70 years. Majority of the patients belonged to the 16-25 years (55 patients, 24.3%) and 26-35 years (54 patients, 23.9%) age group. As for the religion, was concerned 80.1% subjects were Hindu and 17.7% were Muslim. Blunt trauma was highest (68.6%) in subjects living in rural areas, whereas the proportion of subjects belonging to Urban and Semi-urban area were 12.8% and 18.6% respectively. Among the injured patients, 25.7% were students, whereas 21.2%, 16.8%, 12.4% and 11.5% were farmer, in service, housewife and laborers, respectively.

3.2. Injury profile

Table 2 shows the injury profile of the study subjects. It was observed that commonest place of injury was street or road (30.5%) followed by home (27.9%), work place (17.7%), playground or place of recreation (13.3%) and school (9.3%). Maximum injury occurred during summer season (39. 3%). Most common type of injury was non-occupational type in 184 (81·4%) cases, however in 42 (18.6%) cases blunt ocular trauma was related to patient's occupation.

Common occupational injuries were related to agriculture work (8.8%) followed by building work (4.4%) and engineering work (3.1%). Among the non-occupational injury cases, most common was road traffic accident (RTA) related (26.5%) followed by recreational or sports related (22.6%) and assault related (21.7%). However, in 23 (10.2%) cases injury occurred due to fall or domestic accidents.

Vegetative material and wooden objects (like lathi, gulli-danda, bat, hockey & table/ door etc.) were the most frequent traumatic agents, seen in 59 (26.1%) cases. Other causative agents of blunt trauma were stone / brick (25.2%), metallic objects like iron rod, handle etc. (23.1%), ball (9.7%) fist / hand (4.9%) and animal horn (4.4%). However, in 15 (6.6%) cases agent of blunt trauma was not defined. Collision or impact of objects and projectile object was the commonest mode of blunt ocular trauma in 39.3% and 30.1% study subjects.

3.3. Pattern of ocular injury

Table 3 shows the pattern of ocular injury. About 32.3% of patient had isolated ocular injury while rest 67.7% were polytrauma patients. 23.5% of patients had head injury along with ocular trauma, 15.0% cases had oculofacial injuries while 16.4% patients had eye, head and maxillofacial trauma . 211 (93.4%) victims had unilateral ocular involvement and only 15 (6.6%) patients had bilateral injury. Maximum (53.1%) patients had left eye involvement.

Out of 241 injured eyes, 34 (14.0%) had only globe injury and in 59 (24.5%) eyes only ocular adnexae (lid & orbit) was involved. However simultaneous globe and adnexae were injured in 148 (61.4%) eyes. 19.9% eyes had open globe injury while 55.6% had closed globe injury (Table 4).

3.4. Clinical presentation

Most common conjunctival finding was congestion & chemosis (73.9% eyes) and sub-conjunctival hemorrhage (47.3% eyes). Among the periocular and lid injuries, 108 (44.8%) eyes had contusion/ ecchymosis (Figure 1), 40 (16.6%) had abrasion and 59 (24.5%) eyes had laceration (Figure 1). Commonest orbital trauma was bony fracture (63.9% eyes) and orbital hemorrhage & emphysema (23.2% eyes). Orbital walls were spared in 87 (36.1%) eyes. Most common orbital wall fracture was floor fracture (26.1%) followed by medial wall fracture (21.6%). Roof of orbit was involved in 15.8% eyes (Figure 3). (Table 5)

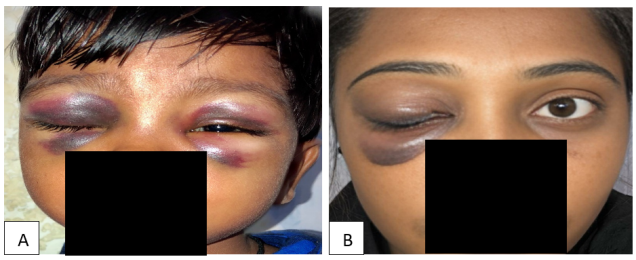

Fig. 1: A): Young boy having blunt trauma due to fall from height showing both eye both eyelid ecchymosis; **B:** Clinical photograph of a young girl having blunt trauma of right eye with projectile object showing ecchymosis & edema of both eyelid of right eye

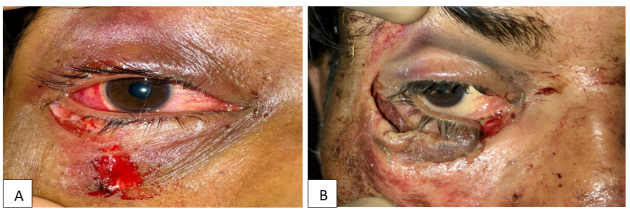

Fig. 2: A): Clinical photograph of adult male having assault related blunt trauma right eye showing abrasion of right lower eyelid and temporal sub-conjunctival hemorrhage; **B:** Clinical photograph of a adult male having RTA related blunt trauma showing abrasion and laceration of right lower eyelid involving lower canaliculi

Out of 241 injured eyes 182 (75.5%) had globe injury. 50 (20.7%) eyes had purely posterior segment injuries, 76 eyes (31.5%) had purely anterior segment injuries and 56 (23.2%) eyes had both anterior & posterior segment injuries. Most common anterior segment finding was corneal abrasion (45.6% eyes) followed by hyphema (44.0%), traumatic mydriasis (35.7%), lens dislocation (22.8%) (Figure 4), corneo-scleral rupture (19.9%), traumatic cataract (17.4%), iridodialysis (16.6%) and lens subluxation (13.7% eyes) (Table 6).

Posterior segment damage was seen in 106 (44.0%) eyes. Commonest posterior segment finding was vitreous hemorrhage (33.2% eyes) followed by retinal detachment (20.3% eyes), retinal hemorrhage (15.8% eyes) retinal tear / hole (11.6% eyes) and traumatic optic neuropathy (2.9% eyes). Post traumatic endophthalmitis was observed in 13 (5.4%) eyes. (Table 6)

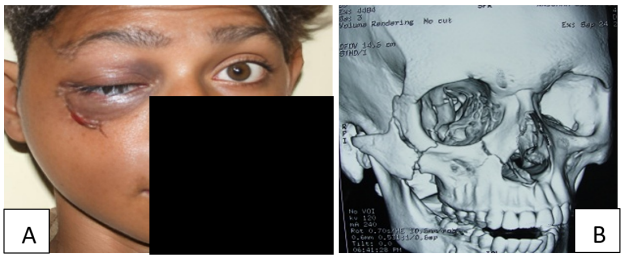

Fig. 3: A: Young male having blunt trauma of right orbit with cricket bat showing ecchymosis both eyelid, periocular swelling & lower lid laceration; **B**: 3 D-reformated CT Scan image showing multiple displaced fracture of maxillary & zygomatic bone involving right floor & lateral wall of orbit

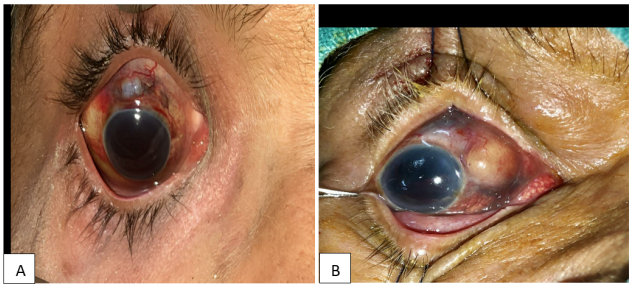

Fig. 4: A: Blunt ocular trauma causing scleral rupture with total hyphema; **B:** Cow horn injury causing Phacocele with Hyphaema

At the time of initial presentation vision was good (VA > 6/12) in 80 (33.2%) eyes, visual impairment (VA 6/18- 6/60) was observed in 69 (28.6%) eyes and blindness (< 6/60 - NOPL) in 86 (35.7%) eyes while visual acuity could not be assessed in 6 (2.5%) eyes (Table 7).

As extent of globe injury was concerned, Zone-III injuries were more common in eyes with closed globe injury (35, 14.5% eyes) as compared to open globe injury (12, 5.0% eyes) (Figure 5) while Zone-II injuries were almost equal in eyes with open globe injury (19, 7.9%) to that of closed globe injuries (18, 7.5%) (Tables 8 and 9). 46 injured right eyes had ≤ 3 ocular structure involvement and 36 eyes had ≥ 4 structure involved while 72 injured left eyes had ≥ 4 ocular structure involvement.

3.5. Treatment outcome and visual prognosis

Maximum (n=115, 50.9%) patients were managed by conservative / medical treatment, 46 (20.4%) underwent for only ocular surgery (Figure 5), however 65 (28.8%) patients required multidisciplinary treatment. Table 10 represents final visual outcome. After 6 months, vision was good in 138 eyes (57.3%), impaired vision in 48 (19.9%) eyes and blindness in 51 eyes (21.2%). However, Final visual outcome could not be assessed in 4 (1.7%) eyes due to lack of final follow-up. Table 11 showed important prognostic factor (ocular trauma score) in injured eyes. Ocular trauma score was in category I (<45) in 36 (14.9%) eyes (RE=6, LE=30). OTS was in category II (45-65) in 4.1% of right eye and 2.9% of left injured eye. OTS was in category III (66-80) in 24 (9.9%) eyes and in category V (92-100) in 70 (29.0%) eyes. However, OTS could not be determined in 20 (8.3%) eyes. Most of the eyes with globe rupture had lower level (category I & II). Lower OTS level tends to indicate poor prognosis.

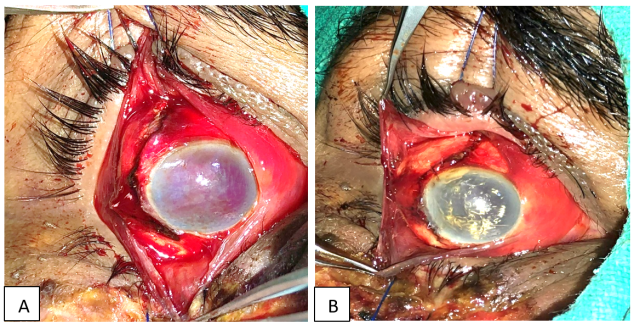

Fig. 5: A: Assault related Blunt trauma causing scleral rupture (Zone-III) with corneal edema & hyphema; **B:** Repaired scleral rupture

Visual impairment and blinding outcome were more common in left injured eyes. Visual outcome was poor in eyes having zone-III open globe injury/ posterior segment involvement including vitreous hemorrhage & retinal detachment etc. Six months after the treatment, 176 (77.8%) of victims had improvement, 14 (6.2%) were unchanged and 30 (13.3%) were deteriorated while 4 (1.8%.) were absent from last follow-up. Outcome was poor in eyes having ≥ 3 ocular structure involvement.

4. Discussion

Blunt objects are most common source of mechanical ocular trauma. In our series of 402 ocular injury cases 56.2% had blunt trauma. We analyzed 226 patients with 241 eye injuries caused by blunt traumatic agents. Our study concurs with MacEwen et al. (65%),[12] Adamu et al. (77.8%),[13] Titiyal GS et al. (32.7%)[14] and Mark YZ Wong (32.6%)[15] who reported higher Incidence of blunt ocular trauma. In contrast to this study Okoye OI (61%),[16] Kaur et al. (73.7%),[17] and Krishnan et al (69.2%)[18] reported more of penetrating ocular injuries caused by sharp object.

Table 1: Demographic profile of study subjects

Demographic Characteristics		Number (N=226)	Percentage
Age (Years)	0 – 5	11	4.9
	6-15	38	16.8
	16-25	55	24.3
	26-35	54	23.9
	36-45	34	15.0
	46-55	18	8.0
	56-65	10	4.4
	>65	6	2.7
Sex	Male	181	80.1
	Female	45	19.9
Residence	Urban	29	12.8
	Semi-urban	42	18.6
	Rural	155	68.6
Religion	Hindu	181	80.1
	Muslim	40	17.7
	Others	5	2.2
Occupation	Former	48	21.2
	Laborer	26	11.5
	Factory Worker	18	8.0
	House Wife	28	12.4
	Student	58	25.7
	Service	38	16.8
	Others	10	4.4

In this study about 50% blunt ocular injuries occurred in the most productive age group (16-45 years of age). Males (80.1%) more commonly sustained blunt ocular trauma as compared to females (19.9%). This was consistent with the study done by Nayagam G et al.,[19] Saxena R. et al.,[20] Titiyal GS et al.[14] and Oluyemi F et al.[21] This male predominance seems to be due to outdoor activity, nature of occupational exposure, participation in dangerous recreational activities & sports, risk-taking behaviors, alcohol use and increase interpersonal conflicts.

Present study showed higher prevalence of blunt ocular trauma in rural population (68.6%) as compared to urban one (12.8%) in contrast to findings of Sujatha, MA et al who reported 78.% of blunt trauma in urban population.[22] Dandana et al and Nirmalan et al also. reported higher prevalence in rural population.[23,24]

In the current study, commonest place of injury was street / road (30.5%) followed by home (27.9%), work place (17.7%) and playground (13.3%). While in previous studies work place was found to be the commonest place of trauma.[1,25,26] We observed that female subjects, were more likely injured at home while men were likely suffered by road traffic accidents and at work place trauma which is the similar to the results found in the study by Oum et al, Maurya R P et al. and Syal E. et al.[25,27,28]

In this study most common cause of blunt ocular trauma was RTA (26.5%) followed, by sports or recreational activities (22.6%) and physical assaults (21.7%). Previous studies also reported RTA as a commonest cause of blunt ocular trauma.[29–31]

In our study, commonest source of ocular trauma was wooden object (26.1%) like lathi, branch of tree, hockey, cricket bat etc. followed by stone / brick (25.2%) and metallic objects (23.1%) like metal rod, nail, handle etc. Rest sources of blunt trauma were ball (9.7%), hand & fist (4.9%) and animal horn (4.4%). Syal E et al was found most common traumatic agent as metallic objects (28.5%) followed by vegetative materials (11.0%).[25] Pearlman et al. reported blunt ocular trauma caused by airbags.[9]

Majority (93.4%) of victims had unilateral blunt ocular trauma with predominance of left eye involvement (53%). However only 6.6% victims had bilateral involvement. Previously we reported overall bilaterally 8.5%.[3,32] Low bilaterality was reported in several studies e.g. Bucan et al (1%),[33] MacEwen (2%),[12] Babar et al (2.9%)[34] and Jahagir et al (3%).[6] We observed maximum bilaterally and left eye involvement in victim's having RTA and assault related ocular trauma. About 32.3% of patient had isolated ocular trauma and rest 67.7% had associated polytrauma. Most common associated polytrauma was head injury (52.7%) and maxillo-facial trauma (31.4%). Ababneh et al (75%)[35] was also reported head and neck trauma as most frequent associated body injuries with ocular trauma.

In the present study the most common ocular part involved was ocular adnexa in 85.9% eyes followed by globe injury in 75.5% eyes. 24.5% injured eyes had only adnexal injury. However 61.4% eyes had simultaneous globe and adnexal injuries Syal E et al. reported combined

Table 2: Injury profile of the study subjects

Characteristics			Number (N=226)	Percentage
Place of Injury	Home		63	27.9
	School		21	9.3
	Playground		30	13.3
	Street / Road		69	30.5
	Work Place		40	17.7
	Miscellaneous		3	1.3
Circumstances of Injury	Occupational (42, 18.6%)	Agriculture	20	8.8
		Engineering	7	3.1
		Carpentry	3	1.3
		Building work	10	4.4
		Others	2	0.9
	Non-occupational (184, 81.4)	RTA	60	26.5
		Assault	49	21.7
		Sports related	51	22.6
		Fall / Domestic Accidents	23	10.2
		Others	1	0.4
Mode of Injury	Projectile Object		68	30.1
	Fall		56	24.8
	Collison / Impact		89	39.3
	Blast Injury		2	0.9
	Animal attack		6	2.7
	Miscellaneous		5	2.2
Traumatic Agents	Muslim		40	17.7
	Wooden objects		59	26.1
	Stone / Brick		57	25.2
	Metallic Objects		52	23.1
	Ball		22	9.7
	Fist / Hand		11	4.9
	Animal Horn / Hood		10	4.4
	Others		15	6.6

Table 3: Pattern of injury

Characteristics			Number (N=226)	Percentage
Laterality	Right Eye		91	40.3
	Left Eye		120	53.1
	Bilateral		15	6.6
	Isolated Eye Injury		73	32.3
Number of Body Organ involved	Polytrauma (153, 67.7%)	Eye & Face	34	15.0
		Eye & Head	53	23.5
		Eye, Head & Face	37	16.4
		Eye, Head & Limb	21	9.3
		Eye, Head & Abdomen	8	3.5

Table 4: Distribution of eyes according to ocular structure involved

Structure Injured	Number of Eyes (N=241)	Percentage
Only Adnexal Injury	59 (RE 26, LE 33)	24.5
Only Open Globe Injury	15 (RE 3, LE 12)	6.2
Only Closed Globe Injury	19 (RE 11, LE 27)	7.9
Adnexal + Open Globe Injury	33 (RE 6, LE 27)	13.7
Adnexal + Closed Globe Injury	115 (RE 60, LE 55)	47.7

Table 5: Distribution of eyes according to adnexal injury

Structure Injured			Number of Eyes (N=241)	Percentage
	Contusion / ecchymosis		108	44.8
Eyelid Injury	Abrasion / edema		40	16.6
	Laceration		59	24.5
	Emphysema/ Hemorrhage		56	23.2
		Floor	63	26.1
Orbital Trauma	Orbital Fracture 154(63.9%)	Medial Wall	52	21.6
		Lateral Wall	43	17.8
		Roof	38	15.8
	Congestion / Chemosis		178	73.9
Conjunctival Injury	Sub-conjunctival hemorrhage		114	47.3
	Laceration		4	1.7

(Many eyes had multiple adnexal injuries)

Table 6: Distribution of eye according to ocular findings

Changes in Eyeball		Number of Eyes (N=241)	Percentage
Anterior Segment Changes			
	Corneal Abrasion	110	45.6
Cornea & Sclera	Lamellar Laceration	21	8.7
	Corneo-scleral Rupture	48	19.9
	Hyphema	106	44.0
Anterior Chamber	A.C Reaction	23	9.5
	Lens Matter	26	10.8
	Traumatic Mydriasis	86	35.7
Iris & Pupil	Iridodialysis	40	16.6
	Uveal prolapse	46	19.1
	Vossius Ring	19	7.9
Lens	Traumatic Cataract	42	17.4
	Lens Subluxation	33	13.7
	Lens Dislocation	55	22.8
Posterior Segment Changes			
Vitreous	Vitreous Hemorrhage	80	33.2
	Endophthalmitis	13	5.4
	Retinal/Macular Edema	26	10.8
Retina	Retinal tear / Macular hole	28	11.6
	Retinal Hemorrhage	38	15.8
	Retinal Detachment	49	20.3
Optic Nerve		7	2.9

Table 7: Initial grade of visual acuity (N=241 Eyes)

Grade of Visual Acuity	Right Eye No (%)	Left Eye No (%)	Total No (%)
Good Vision (> 6/12)	37 (15.4%)	43 (17.8%)	80 (33.2%)
Visual Impairment (6/18-6/60)	27 (11.2%)	42 (17.4%)	69 (28.6%)
Blindness (< 6/60-No PL)	38 (15.8%)	48 (17.4%)	86 (35.7%)
Could not be assessed	4 (1.7%)	2 (0.8%)	6 (2.5%)

Table 8: Distribution of injured eyes according to zone of closed globe injury

Zone of Injury	Right Eye No (%)	Left Eye No (%)	Total No (%)
Zone I	38(15.8%)	43 (17.8%)	81(33.6%)
Zone II	12 (4.9%)	6(2.5%)	18(7.5%)
Zone III	21 (8.7%)	14 (5.8%)	35 (14.5%)
N/A	9(3.7%)	39 (16.2%)	48 (19.9%)
Total	80 (33.1%)	102 (42.3%)	182 (75.5%)

Table 9: Distribution of injured eyes according to zone of open globe injury

Zone of Injury	Right Eye No (%)	Left Eye No (%)	Total No (%)
Zone I	5 (2.1%)	12 (5.0%)	17 (7.1%)
Zone II	2 (0.8%)	17 (7.1%)	19 (7.9%)
Zone III	2 (0.8%)	10 (4.1%)	12 (5.0%)
N/A	71 (3.7%)	63 (26.1%)	134 (55.6%)
Total	80 (33.1%)	102 (42.3%)	182 (75.5%)

Table 10: Final visual outcome after 6 months (N=241 Eyes)

Grade of Visual Acuity	Right Eye No (%)	Left Eye No (%)	Total No (%)
Good Vision (> 6/12)	60 (24.9%)	78 (32.4%)	138 (33.2%)
Visual Impairment (6/18-6/60)	26 (10.8%)	22 (9.1%)	48 (19.9%)
Blindness (< 6/60-NPL)	16 (6.6%)	35 (14.5%)	51 (21.2%)
Could not be assessed	4 (1.7%)	–	4 (1.7%)

Table 11: Distribution of injured eyes according to ocular trauma score

Ocular Trauma Score	Right Eye No (%)	Left Eye No (%)	Total No (%)
Category I (< 45)	6 (2.4%)	30 (12.4%)	36 (14.9%)
Category II (45-65)	10 (4.1%)	7 (2.9%)	17 (7.1%)
Category III (66-80)	10 (4.1%)	5 (2.1%)	15 (6.2%)
Category IV (81-91)	14 (5.8%)	10 (4.1%)	24 (9.9%)
Category V (92-100)	30 (12.4%)	40 (16.6%)	70 (29.0%)
Could not be assessed	10 (4.1%)	10 (4.1%)	20 (8.3%)

injury of adnexa and globe in 15% cases.[25]

In current study commonest adnexal injury was contusion / ecchymosis of eyelid (44.8%) followed by eyelid edema (71.4%), orbital fractures (63.9%) and sub-conjunctival hemorrhage (47.3%). Syal E et.al reported 46% contusional injury.[25] Pai SG et al. reported lid edema / ecchymosis in 62.5% patients and 37.5% patients had sub-conjunctival hemorrhage.[29] Comparable percentage reported by Ababneh et al (eyelid hematoma in 52.7% and SCH in 33.9% patients)[35] and Soni et al (eyelid hematoma in 46.0% and SCH in 23.0% patients).[36]

We noticed that 56.6% eyes had closed globe injury and rest 19.9% eyes had globe rupture. Mishra A et al reported rupture globe in 13.6% of all ocular injuries.[37] Mishra However closed globe injuries were found to be more common in several studies eg Marudhamuthu et al (95.3%),[38] Syal E et al (60.5%)[25] and Oum et al.[27]

In present study 182 eyes had globe injury. 76 eyes had purely anterior segment injury and 50 eyes had purely posterior segment injury while 56 eyes had both anterior and posterior segment injuries. Syal E et al found isolated posterior segment injury in 10% patients.[25]

In our study commonest type of anterior segment finding observed were corneal abrasion (45.6%), hyphema (44.0% eyes) and traumatic mydriasis (35% eyes). Traumatic cataract was most common type lens injury seen in 17.4% eyes. Liggett PE et al found that hyphema was present in 50% of the patients having blunt ocular trauma.[39,40]

The most recorded posterior segment finding in our study was vitreous hemorrhage (33.2%) followed by retinal detachment (20.3%). Upon initial presentation 86 (35.7%) eyes were blind. 69 (28.6%) eyes had visual impairment. On final follow-up the number of visually impaired eyes had fallen to 48 (19.9%) and blind eye to 51 (21.2%).

In this study ruptured globe have worse prognosis than closed globe injury. Similar findings were reported by other researchers.[41] Our finding suggests that poor visual outcome depends on initial visual acuity, extent of injury, presence of intraocular hemorrhage, lens injury, uveal prolapse and retinal detachment.

5. Conclusion

We can conclude from our study that blunt trauma is the commonest mode of ocular injury. RTA, physical assault and sport related injuries are common causes of blunt ocular trauma. Young adult males are more vulnerable. Intraocular hemorrhage (hyphema & vitreous hemorrhage), zone III injury, posterior segment involvement and low ocular trauma score (category I & II) are poor prognostic factors.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Mccarty CA, Fu CL, Taylor HR. Epidemiology of ocular trauma in Australia. *Ophthalmology*. 1999;106(9):1847–52.
2. Schein OD, Hibberd PL, Shingleton BJ, Kunzweiler T, Frambach DA, Seddon JM, et al. The Spectrum and burden of ocular injury. *Ophthalmology*. 1988;95(3):300–5.
3. Maurya RP, Srivastav T, Singh VP, Mishra CP, Al-Mujaini A. The epidemiology of ocular trauma in northern india; A teaching hospital study. *Oman J Ophthalmol*. 2019;12(2):78–83.
4. Shukla B, Agarwal R, Shukla D, Seen S. Systematic analysis of ocular trauma by a new proposed ocular trauma classification. *Indian J Ophthalmol*. 2017;65(8):719–22.
5. Katz J, Tielsch JM. Lifetime prevalence of ocular injuries from the Baltimore eye survey. *Arch Ophthalmol*. 1993;111(11):1564–8.
6. Jahangir T, Butt NH, Hazma U, Tayyab H, Jahangir S. Pattern of Presentation and Factors Leading to Ocular Trauma. *Pak J Ophthalmol*. 1993;27(2):96–102.
7. Koval R, Teller J, Belkin M, Romem M, Yanko L, Savir H. The Israili Ocular injury study: A nationwise collaborative study. *Arch Ophthalmol*. 1988;106(6):776–80.
8. Parmar IP, Nagpal RC, Sunandan S. Pattern of ocular injuries in Haryana. *Indian J Ophthalmol*. 1985;33(3):141–4.
9. Pearlman JA, Eong KGA, Kuhn F, Pieramici DJ. Airbags and Eye injuries : epidemiology,spectrum of injury, and analysis of risk factors. *Surv Ophthalmol*. 2001;46(3):234–42.
10. Maurya RP, Kumar P, Yadav I, Bhusan P, Singh VP, Singh MK. Cow horn injury causing scleral rupture with subconjunctival dislocation of cataractous lens. *Med Res Chronicles*. 2015;2(1):56–60.
11. Wolter JR. Coup-contrecoup mechanism of ocular injuries. *Am J Ophthalmol*. 1963;56:785–96.
12. Macewen CJ, Baines PS, Desai P. Eye injuries in children: The current picture. *Br J Ophthalmol*. 1999;83(8):933–6.
13. Adamu MD, Muhammad N. Pattern of ocular trauma in Gusau, North west Nigeria. *Niger J Ophthalmol*. 2017;25(1):11–3.
14. Titiyal GS, Prakash C, Gupta S, Joshi V. Pattern of ocular trauma in tertiary care hospital of Kumaon Region. *J Indian Acad Forensic Med*. 2013;35(2):116–9.
15. Wong MY, Man RE, Gupta P, Sabanayagam C, Wong TY, Yu C, et al. Prevalence, subtypes, severity and determinants of ocular trauma: The Singapore Chinies Eye Study. *Br J Ophthalmol*. 2018;102:204–9.
16. Okoye OL. Eye injury requiring hospitalization in Enugu, Nigeria. A one-year survey. *Niger Surg Res*. 2006;8(1):34–7.
17. Kaur A, Agarwal A. Pediatric ocular trauma. *Curr Sci*. 2005;89:43–6.
18. Krishnan M, Sreenivasan R. Ocular injuries in union territory of Pondicherry .Clinical presentation. *Indian J Ophthalmol*. 1998;36:82–5.
19. Nayagam G, Raman M, Anuradha A, Sheela S, Chakravarthy N. Assessment of visual prognosis using ocular trauma score in open globe injury at a tertiary care centre. *TNOA J Ophthalmic Sci Res*. 2020;58:9–13.
20. Saxena R, Sinha R, Purohit A, Dada T, Vajpayee RB, Azad RV. Pattern of pediatric ocular trauma in india. *Indian J Pediatr*. 2002;69(10):863–7.
21. Oluyemi F. Epidemiology of penetrating eye injury in Ibadan: A 10 year hospital-based review. *Middle East Afr J Ophthalmol*. 2011;18:159–63.
22. Sujatha MA, Nazlin A, Prakash S, Nousheen S. Prevalence of Visual Impairment after Blunt Ocular Trauma in a Tertiary Hospital. *Int J Sci Stud*. 2015;3(4):36–9.
23. Dandona L, Dandona R, Srinivas M, John RK, McCarty CA, Rao GN. Ocular trauma in an urban population in southern india ;the Andhra Pradesh Eye Disease Study. *Clin Exp Ophthalmol*. 2000;28(5):350–6.
24. Nirmalan PK, Katz J, Tielsch JM, Robin AL, Thulasiraj RD, Krishnadas R, et al. Ocular trauma in a rural south Indian population: The Arvind comprehensive Eye Survey. *Ophthalmology*. 2004;111(9):17778–81.
25. Syal E, Dhawan M, Singh SP. To study the epidemiological and clinical profile of ocular trauma at a tertiary health-care facility. *Delta J Ophthalmol*. 2018;19(4):259–67.
26. Smith AR, O'Hagan SB, Gole GA. Epidemiology of open- and closed-globe trauma presenting to Cairns Base Hospital, Queensland. *Clin Exp Ophthalmol*. 2006;34(3):252–9.
27. Oum BS, Lee JS, Han YS. Clinical features of ocular trauma in emergency department Korean. *J Ophalmol*. 2004;18:70–8.
28. Maurya RP, Prakash S, Sen PR, Gautam SK, Singh S. Profile of assault victims attending an emergency outpatient department of a teaching hospital in India. *Sch J App Med Sci*. 2015;3(1B):92–7.
29. Pai SG, Karnath SJ, D'Souza S, Dudeja L. A clinical study of blunt trauma in a Tertiary care centre. *Online J Health Allied Sci*. 2013;12(2):10.
30. Akbar BA, Khadadad M, Alaleh ES. Prevalence of hyphaema and its complications in patients with blunt eye trauma. *Med Sci J Islam Azad Univ*. 2009;4(4):259–64.
31. Mackay GM. Incidence of trauma to the eyes of car occupants. *Trans Ophthalmol Soc U K*. 1975;95:311–4.
32. Maurya RP, Singh VP, Ul-Kadir SM, Das JK. The study of simultaneous bilateral ocular trauma in Northern India :clinical presentation, epidemiology and patterns of injury. *Int Ophthalmol*. 2022;42(4):1193–1203.
33. Bucan K, Matas A, Lovrić JM, Balistic D, Borjan IP, Puljak L, et al. Epidemiology of ocular trauma in childrenrequiring hospital admission:A16 - year retrospective cohort study. *J Glob Health*. 2017;7(1):010415. doi:10.7189/jogh.07.010415.
34. Babar TF, Khan MN, Jan SU, Shah SA, Zaman M, Khan MD. Frequency and causes of bilateral occular trauma. *J Coll Physicians Surg Pak*. 2007;17(11):679–82.
35. Ababneh LT, Mohidat H, Abdelnabi H, Kana'an MF, Tashtush NA, El-Mulki OS, et al. Hospital-based ocular trauma: Factors, Treatment, and Impact Outcome. *Clin Ophthalmol*. 2019;13:2119–26.
36. Soni M, Khan IU, Jadoon Z. The pattern of ocular trauma in patients at Govt. Naseerullah Khan Babar Memorial Hospital, Peshawar (A study from 2010-2014). *Ophthalmol Update*. 2015;32(4):221–75.
37. Mishra A, Verma AK. The pattern and visual outcomes of non-operational role: a 36 months retrospective analysis. *J Clin Ophthalmol Res*. 2014;2(3):141–4.
38. Marudhamuthu E, Sivakumar N, Kumaravel T. Study of ocular injuries in road traffic accident patients. *J Eval Med Sci*. 2017;6(41):3219–22.
39. Ligett PE, Pince KJ, Barlow W, Ragen M, Ryan SJ. Ocular trauma in an urban population. Review of 1132 cases. *Ophthalmology*. 1990;97(5):581–4.
40. Desai P, Macewen CJ, Baines P, Minassain DC. Incidence of cases of ocular trauma admitted to hospital and incidence of blinding outcome. *Br J Ophthalmol*. 1976;80(7):592–6.
41. Rahman I, Maino A, Devadason D, Leatherbarrow B. Open globe injuries: factors predictive of poor outcomes. *Eye (Lond)*. 2006;20(12):1336–41.

Author biography

Rajendra Prakash Maurya, Associate Professor

Virendra Pratap Singh, Professor

Swati Gautam, -

Asha, Junior Resident

Anil Kumar, Professor

C. P Mishra, Professor

P Jain, Ex-Professor

Anjali Singh, Assistant Professor

Shivangi Singh, Senior Resident

Syeed Mehbub Ul Kadir, Assistant Professor https://orcid.org/0000-0002-2077-6784

Farzad Pakdel, Professor https://orcid.org/0000-0001-7392-6056

Ekagrata Shukla, Resident

Amit Patel, Junior Resident

Cite this article: Maurya RP, Singh VP, Gautam S, Asha, Kumar A, Mishra CP, Jain P, Singh A, Singh S, Ul Kadir SM, Pakdel F, Shukla E, Patel A. Study of epidemiology, clinical profile, visual outcome and prognostic factors of blunt ocular trauma in a teaching hospital. *Indian J Clin Exp Ophthalmol* 2022;8(4):458-467.