



Clinical Characterization of Ocular Trauma at Tertiary Care Centre, Bilaspur, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In this study, we aim to document know the clinical spectrum and mechanism of ocular trauma and benefits of early intervention following injuries among patients presenting to CIMS, Bilaspur. This was a prospective interventional study of all ocular emergencies except chemical injuries presenting between July 2023 and June 2024. Overall, there were 662 ocular emergencies, of which 598 were mechanical injuries (598/662; 90.33%). Most cases of trauma belonged to the 21–30 years age group (322; 53.84%). The most common cause of injury were road traffic accidents. Appropriate preventive measures while driving, and at hazardous workplaces, can potentially reduce ocular injuries.

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1. INTRODUCTION

“Ocular injury is the commonest ocular emergency, which constitute three quarters of cases with the impact of trauma on the human eye ranging from minimal abrasions to a lacerated globe” (Negussie & Bejiga, 2011). Globally, approximately 1.6 million people turn blind every year due to eye injuries (Négrel & Thylefors, 1998; Pizzarello, 1998), most of which are preventable (Hutton & Fuller, 1984). WHO has reported 55 million eye injuries causing restriction of daily

activities, of which 1.6 million go blind every day (Négrel & Thylefors, 1998). Vats et al., have reported “the prevalence of ocular trauma to be 2.4% of population in an urban city in India. 11.4% of these are blind” (Vats et al., 2008).

The nature and patterns of injuries differ from region to region based on occupation and other socio-demographic factors. It is important to understand these patterns, to not only prevent ocular injuries but also to ensure that the appropriate management resources are available.

1.1 Birmingham Eye Trauma Terminology (BETT) (Kuhn et al., 2002)

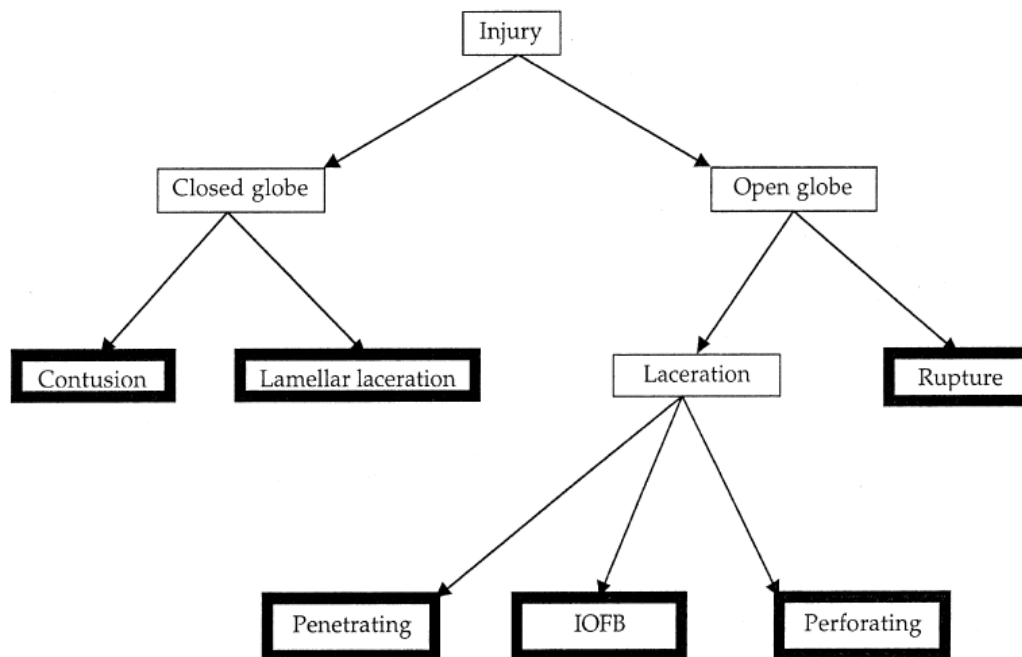


Fig. 1. BETT. The *thick boxes* contain the diagnoses used in clinical practice

1.2 Classification of Ocular Trauma

In ocular trauma classification developed by the Ocular Trauma Classification Group, mechanical trauma to the eyes is divided into open and closed globe injuries (Table 1) (Bullock & Warwar, 1998; De Juan Jr et al., 1983; Groessl et al., 1993).

Table 1. Ocular trauma classification system

	Open globe injury classification	Close globe injury classification
Type	Rupture Penetrating Intraocular foreign body Perforating Mixed	Contusion Lamellar laceration Superficial foreign body Mixed

	Open globe injury classification	Close globe injury classification
Visual acuity ^a	$\geq 20/40$ 20/50-20/100 19/100-5/200 4/200 to light perception No light perception	$\geq 20/40$ 20/50-20/100 19/100-5/200 4/200 to light perception No light perception
Pupil condition	RAPD(+) RAPD(-)	RAPD(+) RAPD(-)
Zone	I: Wounds occur limited to the cornea (corneoscleral limbus included) II: Wounds occur 5 mm posterior to the corneoscleral limbus III: Wounds occur posterior to the anterior 5 mm of the sclera	I: Injuries involve the external structures (confined to the bulbar conjunctiva, sclera, and cornea) II: Injuries involve the internal structures in anterior segment (from the cornea to the posterior lens capsule with the pars plicata included) III: Injuries involve the posterior segment structures posterior to the posterior lens capsule (e.g., retina, macular)

^a Vision should be measured at a distance of 20 ft using Snellen chart or moved to 3 ft when the symbols can't be discerned, with related lens correction (e.g., myopia, astigmatism) and pinhole when pupil dilated. Make sure the fellow eye well is covered thoroughly during the vision test

2. MATERIALS AND METHODS

"This was a prospective interventional study of all ocular emergencies presenting between July 2023 and June 2024. Chemical injuries were excluded. Data were collected using a structured data collection format and recorded for the type of injury, location of the injury, and complete ocular evaluation. The ocular injuries were classified as per Birmingham Eye Trauma Terminology

System" (Bullock & Warwar, 1998). "All mechanical ocular injuries were classified into 3 types: Pure adnexa, adnexa with globe and pure globe involvement. All globe involving ocular traumas were further divided as per BETT into open globe and closed globe injuries with the mechanism of injury included further. These open and closed globe injuries were further divided into zone of injury as per the Ocular Trauma Classification Group" (Bullock & Warwar, 1998; De Juan Jr et al., 1983; Groessl et al., 1993).

3. CASE DISCUSSION

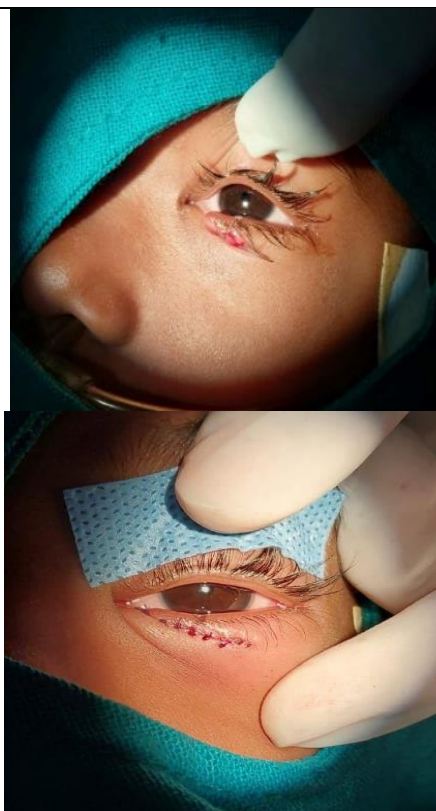
CASE 1-Left eye lower lid avulsion

- Mode of injury-Road traffic accident
- Age/Sex – 50 years/male
- Type of intervention-lid repair under local anaesthesia



CASE 2-Left eye lower lid marginal lid tear

- Mode of injury-Accidental
- Age/Sex – 7 years/male
- Type of intervention-lid repair done in 2 layers under general anaesthesia



CASE 3-Right eye upper lid avulsion

- Mode of injury-Accidental
- Age/Sex – 5 years/male
- Type of intervention-lid repair done in 3 layers under general anaesthesia



CASE 4-Bear bite

- Mode of injury- Bear bite showing avulsion of scalp skin with multiple laceration around eye (Anterior segmnt of both eye was within normal limits)
- Age/Sex – 60 years/male
- Type of intervention- Suturing was done following anti rabies vaccine
- Rabies immunoglobulin infiltration locally and systemically



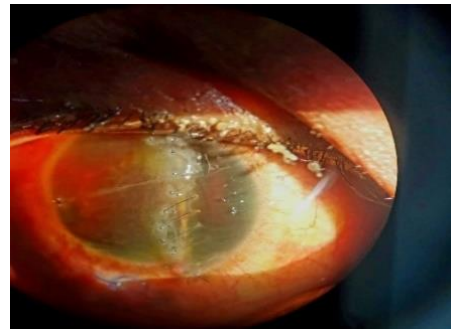
CASE 5-Dog bite

- Mode of injury- Dog bite showing inverted Y-shaped laceration extending from forehead to lower lid of both eye
- Age/Sex – 10 years/male
- Type of intervention- Suturing was done following anti rabies vaccine.
- Rabies immunoglobulin infiltration done locally and systemically.



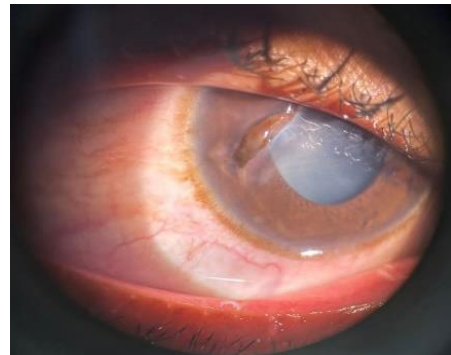
CASE 6- Corneo-scleral tear

- Mode of injury-Accidental
- Age/Sex – 30 years/male
- Visual acuity (Right eye)-PL negative
- Zone involvement -III
- On examination-Full thickness corneal tear extending vertically from 12-6'O clock with scleral tear with uveal tissue prolapse with anterior chamber collapse
- Type of intervention- corneoscleral tear repair done under nil visual prognosis



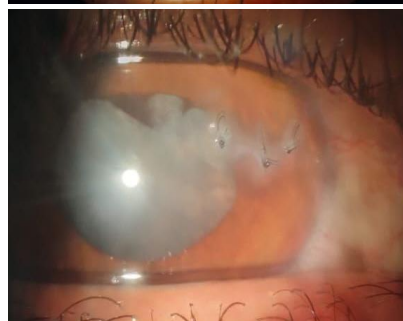
CASE 7- Corneal tear

- Mode of injury- Accidental
- Age/Sex – 28 years/male
- Visual acuity(Right eye)-HM+PR accurate
- Zone involvement -I
- On examination- Right eye full thickness oblique corneal tear extending paracentrally from 8-11'O clock with iris tissue prolapse with traumatic cataract; no intraocular foreign body detected on X-ray
- Type of intervention-Corneal tear repair done followed by lens extraction with posterior chamber intraocular lens implantation at 10 weeks with vision improved to 3/60.



CASE 8- Corneal tear (right eye)-

- Mode of injury- Accidental
- Age/Sex – 24 years/male
- Visual acuity (Right eye)-HM+PR accurate
- Zone involvement -I
- On examination -RE full thickness sealed corneal tear extending horizontally from paracentrally to 3'O clock with iris tissue incarceration with traumatic cataract; no intraocular foreign body detected on X-ray
- Type of intervention-Corneal tear repair done followed by lens extraction with posterior chamber intraocular lens implantation at 20 weeks with vision improved to 6/9.



CASE 9-Conjunctival foreign body (Fish hook wire in palpebral conjunctiva)

- Mode of injury-Accidental
- Age/Sex – 16 years/male
- On examination-fish hook wire present in palpebral conjunctiva
- Procedure-wire removed under topical anaesthesia



4. RESULTS

Overall, there were 662 ocular emergencies, of which 598 were mechanical injuries (598/662;

90.33%). Most cases of trauma belonged to the 21–30 years age group (322; 53.84%). Males were more frequently affected (412/598; 68.89%) as compared to females (186/598;

31.10%). Most cases were unilateral (526/598; 87.95%) and were caused by road traffic accidents (RTAs) (485; 81.10%). Most commonly, adnexal injuries were noted (404/598; 67.55%)

while adnexal with globe involvement was seen in 142 cases. Pure globe involvement was seen in 52 cases (52/598; 8.69%).

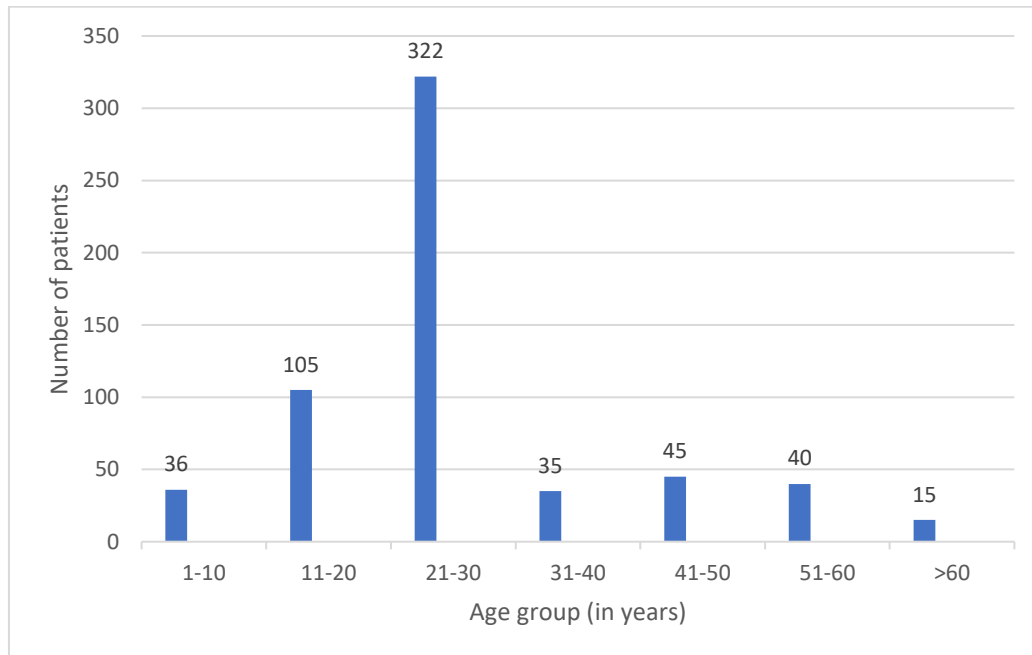
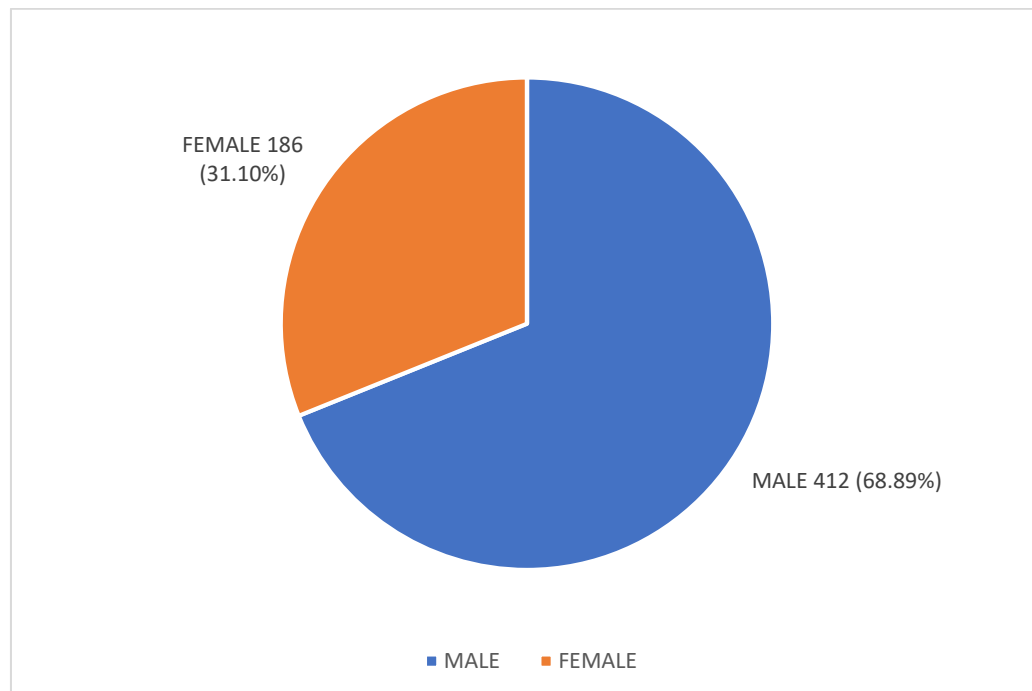


Fig. 2. Distribution of ocular trauma cases according to age group



**Fig. 3. Gender wise distribution
Total-598**

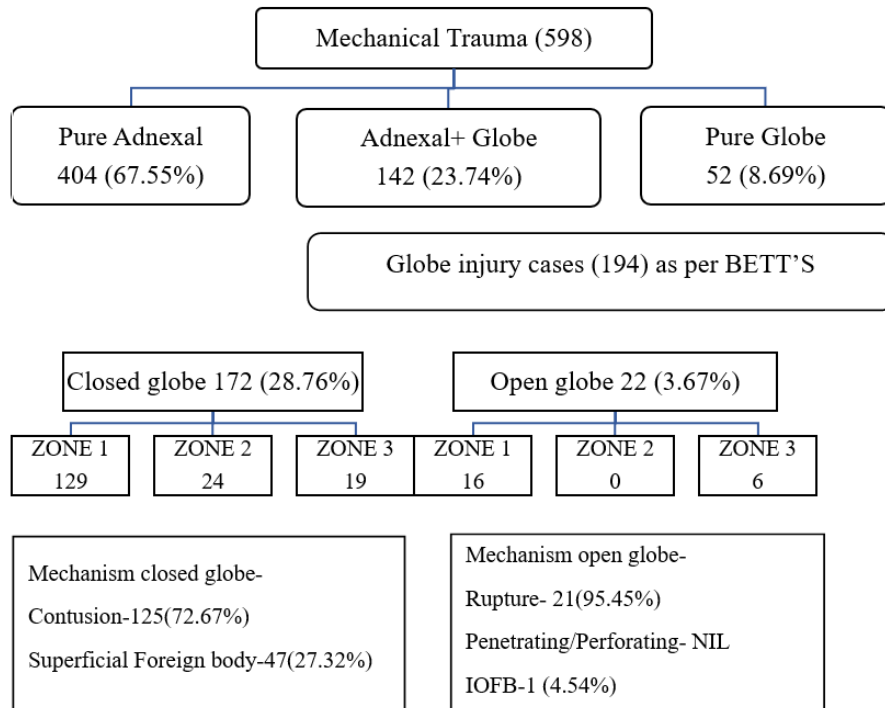


Fig. 4. The distribution and classification of the injuries

Table 2. Ocular examination findings in adnexal injuries

Type	Number
LID	
Lid abrasion and periorbital edema	323(59.15%)
Lid tear, lid abrasion and periorbital edema	78(14.28%)
Eyebrow tear, lid abrasion and periorbital edema	145(26.55%)
TOTAL	546

Table 3. Ocular examination findings in globe injuries

Variable	Category	Number
Conjunctiva	Conjunctival congestion	70
	Subconjunctival haemorrhage	180
	Tear	2
	Foreign body	17
Cornea	Abrasion	18
	Foreign body	30
	Tear	22
Anterior chamber	Hyphaema	8
	Cells, flare	8
Pupil	RAPD	7
	Traumatic mydriasis	8
Posterior segment	Berlin's edema	6
	Retrobulbar neuritis	7
	Choroidal tear	2
	Vitritis	2
	Vitreous	2
	haemorrhage	

5. DISCUSSION

"In our study, the majority of ocular trauma patients (53.84%) were in the age group of 21-30 years. Poy Raiturcar et al. conducted a study among 500 patients, and they reported that the prevalence of ocular injuries was highest in the age group of 21-40 years (45%)" (Raiturcar et al., 2019). "The age distribution of these cases, with nearly half being less than 30 years of age shows that ocular trauma occurs more commonly in younger people" (Revathy et al., 2015; Mishra et al., 2014). In our study, males constituted 68.89% of the patient population while females comprised 31.10%, resulting in a male-to-female ratio of around 2.5:1 in accordance by more involvement of males in driving vehicles, risky occupations compared to females in our country. A study by Karve et al. (2017) found that "males were affected 3.7 times more than females. The most common cause of injury in our cases was road

traffic accidents with almost two-thirds of the cases, as reported in the literature as well" (Titiyal et al., 2013). "The most commonly affected zone in most of the studies is zone 1. We encountered 172 cases (28.76%) of closed-globe injuries and only 3.67% were open-globe injuries; previous studies have shown a prevalence of closed-globe injuries to be as high as 72%" (Syal et al., 2018). The commonest mechanism of injury among closed-globe was contusion while all open-globe cases had blunt rupture. We have encounter 22 cases of corneal and corneoscleral tear in 1 year. In last one year, 3 cases were reported due to bear bite. Out of the bear bite injuries reported, maximum injuries of bear inflicted were due to sudden encounters while doing their morning routine chores.

"Visual acuity at presentation is the most important predictor of prognosis following trauma, which in turn depends on the severity of the injury, posterior segment involvement, and time elapsed between injury and presentation" (Pinaki et al., 2016; Syal et al., 2018; Wadwekar et al., 2023). "Blindness is more likely in patients with open-globe injury than closed-globe injuries. Pure adnexal injuries are unlikely to affect the visual outcome, although they might affect cosmesis. BETTS can be used to describe mechanical globe trauma but it fails to describe adnexal injuries and non-mechanical globe trauma, which makes up a significant proportion of eye injuries" (Kuhn et al., 2002).

6. CONCLUSION

In our study, adnexal injuries were commonest type of ocular trauma noted followed by globe involving ocular injuries. Proper wound irrigation followed by primary closure at the earliest in lacerated wounds helps in prompt healing so it is necessary to raise awareness about getting treatment as soon as possible following injuries. Bear attack injuries require a multidisciplinary team approach, as the injuries are not restricted to one area. In our study, road traffic accidents were the commonest causes of ocular injuries followed by accidental injuries. Males and young adults were particularly affected. We need to explore strategies to minimize ocular trauma as a priority. Appropriate preventive measures while driving and at hazardous workplaces can potentially reduce ocular injuries.

CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his/her/their consent for

his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity but anonymity cannot be guaranteed.

ETHICAL APPROVAL

It is not applicable.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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