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Original Research Article

Epidemiological Factors, Pattern of Injury, and Clinical Outcomes among Ocular Trauma Patients Presenting to the Emergency Department: A Prospective Observational Study

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Abstract:

Background: Ocular trauma (OT) is a preventable cause of visual morbidity and blindness, particularly affecting the productive age group. Emergency department–based data on epidemiology, injury pattern, and outcomes remain limited in many regions.

Aim: To evaluate epidemiological factors, injury patterns, and clinical outcomes among ocular trauma patients presenting to the emergency department.

Methodology: A 6-month prospective observational study was conducted in Department of Ophthalmology, Anugrah Narayan Magadh Medical College, Gaya ji, Bihar, India. including 90 consecutive OT patients. Demographic and injury details were recorded. Injuries were classified using BETTS, and Ocular Trauma Score (OTS) was calculated. Patients were managed as per protocol and followed for visual outcome. Statistical analysis was performed with $p<0.05$ considered significant.

Results: Mean age was 31.8±13.4 years; males constituted 80%. Road traffic accidents (55.6%) and blunt trauma (44.4%) were common, with minimal protective eyewear use (5.6%). Closed-globe injuries predominated (80%), mainly involving eyelid/adnexa and conjunctiva. Good visual outcome (≥6/18) occurred in 64.4% cases. Open-globe injuries showed significantly poorer outcomes than closed-globe injuries ($p=0.001$). Half were managed medically, while 35.6% required surgery.

Conclusion: Ocular trauma mainly affects young males in outdoor settings, commonly due to road traffic accidents. Most cases have favorable prognosis, but open-globe injuries predict poor visual outcome, highlighting the importance of prevention, early assessment, and prompt management.

Keywords: Ocular trauma, epidemiology, BETTS classification, emergency department, visual outcome, Ocular Trauma Score.

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Introduction

Ocular trauma (OT) is a significant public health concern that is largely preventable and has a number of determinants in the changing global environments [1,2]. It is a significant contributor to visual morbidity both in the developing and the developed countries and greatly overlooked aspect of emergency health care. Vision is a central factor in the quality of life, independence, and productivity; thus, any injury done to the eye may result in long-term disability that is disproportionate to the perceived size of the organ in question. Even the slightest trauma may lead to severe complications in case they are not timely identified and addressed. In turn, ocular trauma is not only a medical issue but also a social and economic one, especially in low-resource environments in which the level of awareness, preventive strategies, and early access to ophthalmic treatment can be insufficient.

Eye damage is a significant source of visual loss and blindness [1]. Population surveys have demonstrated that OT is the cause of 20 to 50 percent monocular blindness and 3.2 to 5.5 percent of bilateral blindness cases [3]. These figures reveal the extent to which the issue is a problem and that most cases of blindness are preventable across the globe. In contrast to various chronic ocular disease conditions which build up over the years, ocular trauma results in instant disability, and which may impact on

people who used to be healthy and economically productive in the past [4]. Sadly, the young productive age bracket is the most prevalent victim, and this puts a huge challenge on functional impairment, productivity loss and social economic burden [3-5]. This is further heightened by long term rehabilitation costs, length of stay at hospitals and psychological stress [5].

According to the most popular Birmingham Eye Trauma Terminology System (BETTS), ocular injuries are classified into open- and closed-globe injuries. This universal code of classification allows clinicians and researchers to describe injuries in a consistent way, provides emergency physicians and ophthalmologists with an opportunity to communicate, and enables the comparison of the results in various populations. Types of closed-globe injuries are contusions and lamellar lacerations, whereas types of open-globe injuries are rupture, penetrating injuries, perforating injuries, and intraocular foreign bodies. The conditions of the severity of ocular injury are very diverse, including simple subconjunctival hemorrhage and lid laceration, to extensive lens subluxation or dislocation, vitreous hemorrhage, retinal detachment, traumatic optic neuropathy, orbital fracture, and lens rupture [4-7]. Due to this spectrum, the outcomes vary widely, including full recovery, permanent blindness, and are reliant upon early identification, initial stability and proper referral.

OT management at the emergency department (ED) is a clinical challenge in which the first responders are usually non-ophthalmologists. In most health care systems, particularly developing nations, emergency doctors and general practitioners give the initial contact care. They are required to make quick assessment of visual acuity, find out vision-endangering injuries, safeguard the world further, start prophylaxis to prevent infection, and decide the urgency of ophthalmologic care. Early ED interventions are crucial to the prevention of long-term morbidity and enhancement of visual outcomes [8,9]. Time loss to the correct management of the damaged eye or an intraocular foreign body can exacerbate prognosis and occur most often in the globe rupture or intraocular foreign body. Consequently, epidemiological knowledge about ocular trauma in the context of an emergency should be enhanced to enhance the process of triage and training of clinical personnel.

There is often ocular trauma that entails different levels of facial trauma severity [10]. Both orbital and periocular structures are usually involved in high-velocity road traffic accidents, industrial mishaps, sport injuries, assaults, and domestic incidents. Concomitant injuries like orbital trauma, intracranial injury or maxillofacial cuts may cause clinical displacement of the eye examination and thus lead to the risk of missed diagnosis. Poor management might have blindness or serious visual loss, thus having serious social, economic and medicolegal effects, which once again underscores the importance of quick and effective treatment.

Epidemiology of ocular trauma is very diverse in relation to geographical location, socioeconomic status, employment, cultural beliefs, and access to protective equipment. In industrialized areas, occupational injuries are frequently based on machinery / chemicals and farmland often suffer injuries because of wooden sticks, vegetable material or animal accidents. Seasonal changes have also been explained which represent the variation in the workload of occupations, environmental exposure and leisure activities. Knowledge of these epidemiological determinants will be useful in formulating preventive measures to reduce such occurrences like the protection eyewear initiatives, sensitization, and policy-based interventions.

India is a highly populated nation with vivid geographical and sociocultural areas, which should be considered as the manifestation of different living and working patterns. Nightmarish urbanization, growing industrialization, dependence on agricultural activities, and rising motorization are inputs to different mechanisms of ocular trauma. Trauma associated with plays may be experienced by children, sports injuries by students, and occupational hazards by workers such as metallic foreign objects and chemical burns. Further, the disparities in education level, access to healthcare, and safety compliance also have a further effect on the prevalence and consequences of injuries. It is possible to find some literature regarding epidemiological characteristics and patterns of ocular injuries in North and South of India, as well as its western counterparts, which has been very useful in terms of giving valuable insight on some of the most prevalent mechanisms of the injuries, the demographic distribution of the age and gender.

Nonetheless, the clinical and epidemiological predictors of ocular injuries in some of the regional populations have not been sufficiently studied in literature. The missing element is in the clinical profile and patterns of injury among victims of OT and especially in situations of emergency where the first management decisions are taken. Past research has tended to be retrospective or to focus on ophthalmology departments thus are not capturing the immediate clinical context of emergency care. Prospective observation in the ED enables an evaluation of real-time presentations, triage interventions, initial treatment activities, and early outcomes, which are essential factors that establish the ultimate prognosis of visual affected patients.

To enhance the prevention and treatment of trauma, a full picture of the characteristics of the injury, such as mechanism, severity, and anatomy and systemic

trauma must be established. Epidemiological mapping can be used to determine high-risk groups and activities, whereas outcome assessment can be used to understand the effectiveness of existing protocols. Moreover, record keeping of seasonal trends and environmental cues can contribute to the organization of specific awareness and safety rules. This information can be particularly useful in resource-limited environments where the focus on preventive measures should be based on the local evidence.

The present study aims to comprehensively document the prevalence, injury patterns, severity, seasonal variation, and outcomes among OT patients presenting to the ED. By prospectively evaluating epidemiological factors, patterns of injury, and clinical outcomes, this research intends to bridge the gap between emergency management and ophthalmologic prognosis. The findings are expected to contribute toward developing standardized evaluation protocols, improving early management practices, and promoting preventive interventions. Ultimately, understanding ocular trauma within the emergency context will help reduce avoidable visual impairment and its associated socioeconomic burden.

Methodology

Study Design: This hospital-based prospective observational study was conducted to evaluate epidemiological factors, patterns of injury, and clinical outcomes among patients presenting with ocular trauma to the emergency department. The study was designed in accordance with the Strengthening Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research.

Study Area: The study was carried out in the Department of Ophthalmology, Anugrah Narayan Magadh Medical College & Hospital, Gaya, Bihar, India.

Study Duration: The study was conducted over a period of six months from March 2025 to August 2025.

Sample Size: A total of 90 patients diagnosed with ocular trauma were included in the study. Consecutive sampling was used, and every eligible patient presenting during the study period was enrolled until the desired sample size was achieved.

Study Population: The study population comprised patients of all age groups and both genders presenting to the emergency department with ocular trauma. Patients were screened at presentation and included after confirmation of diagnosis based on clinical examination.

Inclusion Criteria

Patients were included if they fulfilled the following criteria:

- Patients of all age groups and both genders presenting with ocular trauma
- Diagnosed cases of ocular trauma (ICD-10: S05.0 – S05.9)
- Patients presenting within the study duration
- Patients willing to participate and providing written informed consent
- Patients medically stable for ophthalmic examination

Exclusion Criteria

Patients were excluded if:

- Refusal to provide consent
- Inability to respond and absence of reliable attendant/caregiver
- Patients referred after receiving definitive ocular trauma treatment elsewhere
- Follow-up loss before initial evaluation
- Patients with pre-existing severe ocular pathology affecting visual acuity assessment

Data Collection: After obtaining informed consent, detailed information was recorded using a pre-structured case record proforma. Demographic data including age, gender, occupation, and residence were noted. Epidemiological factors such as mode of injury, place of injury, time interval between injury and hospital presentation, use of protective eyewear, and alcohol involvement were recorded. A comprehensive ophthalmic examination was performed, including assessment of visual acuity using the Snellen chart, anterior segment evaluation by torchlight and slit-lamp examination, and posterior segment examination using direct and indirect ophthalmoscopy whenever feasible. Laterality of injury and associated systemic injuries were also documented.

Classification of Ocular Trauma: Ocular injuries were classified according to the Birmingham Eye Trauma Terminology System (BETTS). Injuries were categorized into closed globe injuries, which included contusion and lamellar laceration, and open globe injuries, which included rupture, penetrating injury, perforating injury, and intraocular foreign body.

Ocular Trauma Score: For patients with open globe injuries, the Ocular Trauma Score (OTS) was calculated to predict visual prognosis. The score was determined based on initial visual acuity and associated clinical factors including globe rupture, endophthalmitis, perforating injury, retinal detachment, and relative afferent pupillary defect. OTS categories ranged from 1 to 5, where category 1 indicated the most severe injury and poorest prognosis, and category 5 indicated the least severe injury with favorable prognosis.

Management and Outcome Measures: All patients were managed according to standard treatment protocols. Management included medical treatment,

surgical intervention, combined treatment, or observation with follow-up as required. Clinical outcomes were assessed during follow-up and included final visual acuity, need for surgical procedures, and development of complications such as infection, retinal detachment, or phthisis bulbi. Visual outcome was categorized as improved, stable, or worsened compared to presentation.

Procedure: Patients presenting with ocular trauma in the emergency department were screened for eligibility. After consent, detailed history and examination were performed. Injuries were classified according to BETTS, and OTS was calculated for open globe injuries. Appropriate treatment was provided, and patients were followed up to assess clinical outcomes.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software (R version 4.6.1/SPSS). Categorical variables were expressed as frequencies and percentages. Parametric numerical variables were presented as mean ± standard deviation, while non-parametric variables were expressed as median with interquartile range. The Chi-square test was used to analyze associations between categorical variables. Independent t-test was applied for comparison of parametric variables and Mann–Whitney U test for non-parametric variables. Logistic regression analysis was performed to determine predictors of poor visual outcome. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 presents the sociodemographic and epidemiological profile of 90 ocular trauma patients. The mean age was 31.8 ± 13.4 years, with the highest proportion in the 21–30 year age group (27.8%), followed by 31–40 years (20.0%). Males predominated (80.0%). Injuries most frequently occurred between 4 pm and 8 pm (35.6%). Road traffic accidents were the leading cause (55.6%), followed by domestic injuries (13.3%), physical assault (11.1%), and occupational injuries (10.0%). Blunt trauma was the commonest mechanism (44.4%), while falls accounted for 27.8%. Most injuries occurred in streets/public places (57.8%) and only 5.6% patients used protective eyewear. Alcohol intoxication was present in 15.6% cases. Overall, young adult males were the most affected, with injuries commonly related to road traffic accidents and outdoor activities without eye protection.

Table 1: Sociodemographic and epidemiological variables of ocular trauma patients (n = 90)

Variable	Class	Frequency (%)
Age (years), mean ± SD	31.8 ± 13.4	
Age group (years)	<10	6 (6.7)
	11–20	14 (15.6)
	21–30	25 (27.8)
	31–40	18 (20.0)
	41–50	13 (14.4)
	>50	14 (15.6)
Gender	Male	72 (80.0)
	Female	18 (20.0)
Time of injury	8 am–12 pm	12 (13.3)
	12 pm–4 pm	17 (18.9)
	4 pm–8 pm	32 (35.6)
	8 pm–12 am	16 (17.8)
	12 am–4 am	6 (6.7)
	4 am–8 am	7 (7.8)
Type of trauma	Road traffic accident	50 (55.6)
	Physical assault	10 (11.1)
	Occupational injury	9 (10.0)
	Domestic injury	12 (13.3)
	Sports injury	5 (5.6)
	Others	4 (4.4)
Mechanism of injury	Blunt object	40 (44.4)
	Sharp object	12 (13.3)
	Fall	25 (27.8)
	Chemical injury	5 (5.6)
	Foreign body	8 (8.9)
Place of injury	Street/Public places	52 (57.8)

	Home	23 (25.6)
	Workplace	9 (10.0)
	Farm	4 (4.4)
	School	2 (2.2)
Protective eyewear	Yes	5 (5.6)
	No	85 (94.4)
Alcohol intoxication	Yes	14 (15.6)
	No	76 (84.4)

Table 2 shows the clinical profile of 90 ocular trauma patients. The right eye was most commonly affected (51.1%), followed by the left eye (35.6%), while bilateral involvement occurred in 13.3% cases. Closed globe injuries predominated (80.0%) compared to open globe injuries (20.0%). Regarding tissue involvement, eyelid/adnexal injuries were most frequent (60.0%), followed by conjunctival (53.3%), corneal (28.9%), anterior chamber (20.0%), retinal/choroidal (13.3%), lenticular (11.1%), and optic nerve injuries (2.2%). Associated injuries were absent in 40.0% patients, whereas maxillofacial injuries (35.6%) and head injuries (20.0%) were common, with limb injuries seen in 4.4% cases. Overall, most patients sustained closed globe trauma mainly involving anterior ocular structures, often accompanied by facial or head injuries.

Table 2: Clinical profile of ocular trauma patients (n = 90)

Variable	Class	Frequency (%)
Eye involved	Right	46 (51.1)
	Left	32 (35.6)
	Both	12 (13.3)
Type of injury (BETTS)	Closed globe injury	72 (80.0)
	Open globe injury	18 (20.0)
Tissue involvement	Eyelid/adnexa	54 (60.0)
	Conjunctiva	48 (53.3)
	Cornea	26 (28.9)
	Anterior chamber	18 (20.0)
	Lens	10 (11.1)
	Retina/choroid	12 (13.3)
	Optic nerve	2 (2.2)
Associated injuries	None	36 (40.0)
	Maxillofacial injury	32 (35.6)
	Head injury	18 (20.0)
	Limb injury	4 (4.4)

Table 3 presents the visual acuity at presentation among 90 patients. The majority had relatively good vision, with 38 patients (42.2%) having visual acuity between >6/18 and 6/6. This was followed by 18 patients (20.0%) with vision >6/60–6/18 and 14 patients (15.6%) with >HM–6/60. Poor visual acuity was observed in 11 patients (12.2%) with PL/PR–hand movement and 5 patients (5.6%) with no perception of light. Visual acuity could not be assessed in 4 patients (4.4%). Overall, most patients presented with mild to moderate visual impairment.

Table 3: Visual acuity at presentation (n = 90)

Visual acuity category	Frequency (%)
No perception of light	5 (5.6)
PL/PR – Hand movement	11 (12.2)
>HM – 6/60	14 (15.6)
>6/60 – 6/18	18 (20.0)
>6/18 – 6/6	38 (42.2)
Not assessable	4 (4.4)

Table 4 shows the distribution of Ocular Trauma Score (OTS) among 90 patients. Most patients belonged to Grade 4 (81–91) with 40 cases (44.4%), followed by Grade 3 (66–80) in 18 patients (20.0%) and Grade 2 (45–65) in 14 patients (15.6%). Grade 5 (>91) was observed in 12 patients (13.3%), while the least number of patients, 6 (6.7%), were in Grade 1 (0–44). Overall, the majority of patients had

moderate to good prognostic scores, indicating relatively favorable visual outcomes in most cases.

Table 4: Ocular Trauma Score (OTS) distribution (n = 90)		
OTS Grade	**Raw score range**	**Frequency (%)**
Grade 1	0–44	6 (6.7)
Grade 2	45–65	14 (15.6)
Grade 3	66–80	18 (20.0)
Grade 4	81–91	40 (44.4)
Grade 5	>91	12 (13.3)

Table 5 depicts the management pattern among 90 patients. Half of the patients, 45 (50.0%), were treated with medical management alone. Surgical intervention was required in 32 patients (35.6%), while combined medical and surgical treatment was given to 10 patients (11.1%). Only 3 patients (3.3%) were kept under observation without active treatment. Overall, conservative treatment constituted the major approach, although more than one-third of cases required surgery.

Table 5: Management pattern (n = 90)	
Management	**Frequency (%)**
Medical management only	45 (50.0)
Surgical intervention	32 (35.6)
Combined medical + surgical	10 (11.1)
Observation only	3 (3.3)

Table 6 shows the clinical outcome at follow-up among 90 patients. A good visual outcome (≥6/18) was achieved in the majority of cases, 58 patients (64.4%). Fair vision (6/60–6/18) was observed in 14 patients (15.6%). Poor visual outcome (<6/60) occurred in 13 patients (14.4%), while very poor vision with no perception of light (NPL) was seen in 5 patients (5.6%). Overall, most patients experienced satisfactory visual recovery, with nearly two-thirds attaining good vision at follow-up.

Table 6: Clinical outcome at follow-up (n = 90)	
Outcome	**Frequency (%)**
Good (≥6/18)	58 (64.4)
Fair (6/60–6/18)	14 (15.6)
Poor (<6/60)	13 (14.4)
Very poor (NPL)	5 (5.6)

Table 7 demonstrates a significant association between type of injury and visual outcome (p = 0.001). Among patients with closed globe injury (n=72), the majority achieved good visual outcome (54 cases), while 10 had fair and 8 had poor/very poor vision. In contrast, among open globe injuries (n=18), only 4 patients had good outcome, 4 had fair, and the majority (10 cases) had poor/very poor visual outcome. This indicates that closed globe injuries are associated with significantly better visual prognosis compared to open globe injuries.

Table 7: Association between type of injury and visual outcome					
Type of injury	**Good**	**Fair**	**Poor/Very poor**	**Total**	**p-value**
Closed globe (n=72)	54	10	8	72	**0.001***
Open globe (n=18)	4	4	10	18	

Discussion

The current prospective study of 90 patients with ocular trauma showed that young adults were the largest affected group with the mean age of the group being 31.8±13.4 years with the highest incidence at 21-30 years old (27.8%). This is closely related to the results in the case of Northern India where the third decade was the most susceptible (Mohanty et al., 2022) [11] and other Indian epidemiological series, which display a greater risk of injuries among the economically productive age (Qayum et al., 2016; Vats et al., 2008) [2,4]. Mean cohort age, however, was significantly younger than the 54 years in a Spanish urban population (Belmonte-Grau et al., 2021) [8], which may possibly be due to the different mechanisms of the injuries; our study was comprised of road traffic accidents (RTAs) whereas Western reports domestic or occupational injuries as the most prevalent (McGwin and Owsley, 2005)

[12]. Equally, Choovuthayakorn et al. made similar or even more serious claims that mean age among Asian patients admitted to the hospital was over 39 years [13] that confirms the presence of dependent mechanism of trauma that impacts the demographic distribution."

Our study was characterized by male preponderance (80%), which can be compared to a male to female ratio of about 4.5:1 reported in previous studies in emergency departments (Park et al., 2021; Qayum et al., 2016) [5,2]. More frequent exposure to outdoor facilities and occupational exposure is always cited as the reason why male involvement is higher (Krishnaiah et al., 2006) [3]. The impact of the social and economic factors is significant due to the fact that injuries impact on people at the age when they are most productive, leading to the creation of long-term disability and economic burden (Negrel and Thylefors, 1998) [1].

The most frequent cause in our patients was RTA (55.6) then domestic injuries (13.3) and assault (11.1). The RTAs were the leading etiology in similar Indian-based hospital studies (Raiturcar et al., 2019) [9]. On the contrary, Occupational injuries rank highest in the western and developed Asian context (Voon et al., 2001; Choovuthayakorn et al., 2020) [14,13]. The disparity can be attributed to density of traffic in the region, adherence to safety and wearing of helmets. Protective eyewear was only used by 5.6% of our patients, and 15.6% were drunk at the time of injury, which are similar to the 12% rate of intoxication in emergency trauma groups (Jain et al., 2020) [15]. The fact that protective gear usage is low is an excellent indicator of preventive measures; the usage of helmets is a significant factor of the risk of ocular trauma (Liu et al., 2008) [16]. Our series also reflects the epidemiological RTA trends in eastern India (Sasmal et al., 2020) [17] by having evening-time prevalence (35.6%).

In our study, blunt trauma contributed to 44.4% of the injuries, followed by falls (27.8%), which is similar to Nepalese and Korean studies that reported blunt mechanisms as the most common (Kinderan et al., 2012; Park et al., 2021) [18,5]. The injuries were mostly in public (57.8 percent), which is consistent with trauma caused by RTA. Closed globe injuries formed 80 percent of them, just like 87.7 percent CGIs in tertiary trauma centers reported (Park et al., 2021) [5]. Nevertheless, the proportion of open globe injuries was higher among the hospitalized cases, 48.6, which Choovuthayakorn et al. noted is probably because of the bias in admissions on severe trauma into the hospital (Choovuthayakorn et al., 2020) [13].

The most common tissue injury in our study was eyelid and adnexal (60%), then conjunctival (53.3) and corneal injuries (28.9), which is consistent with the reports that periocular tissues are the first tissue affected during blunt trauma (Magarakis et al., 2012) [10]. There were 35.6% and 20% associated maxillofacial injuries and head trauma, respectively, as reportedly almost half of cases have facial fractures with ocular trauma (Park et al., 2021) [5]. Most epidemiological studies also concur with this (Krishnaiah et al., 2006) [3] because the prevalence of unilateral involvement (86.7) is the highest in our patients.

At presentation, visual quality was good at a huge percentage; 42.2% had a vision of more than 6/18. This is a bit low compared to 69.4% reported in another tertiary-care cohort (Park et al., 2021) [5] but comparable to the community-based findings where permanent blindness was found in a minority (Krishnaiah et al., 2006) [3]. Ocular Trauma Score (OTS) grading revealed that the predominant one was grade 4 (44.4%), which is associated with a good prognosis (similar to the studies where grade IV was the most common category) [5]. OTS has been determined to be a good predictor of visual recovery (Kuhn et al., 2002) [7].

Surgery was performed in 35.6% of patients in the study, which is close to surgeries in tertiary hospitals (30-40% depending on the severity of the injury) (Choovuthayakorn et al., 2020) [13]. Follow-up showed good visual outcome (≥6/18) in 64.4% which is similar to recovery of 74.8% in Nepalese patients (Kinderan et al., 2012) [18]. Notably, prognosis depended heavily on injury type as closed globe injuries were associated with mostly good prognosis (54 good vs. 8 poor) and most open globe injuries yielded poor or very poor vision ($p = 0.001$). Correlated results of open globe injury with adverse visual outcome have remained consistently reported (Park et al., 2021; Kuhn et al., 2002) [5,7].

Comprehensively, our results support the idea that ocular trauma among the developing regions is more common among young men in RTAs, is expressed predominantly in closed globe injury, with relatively positive visual outcome, and is avoidable in case of better adherence to road safety and protection eyewear.

Conclusion

This prospective observational study shows that the occurrence of ocular trauma in the emergency department is mostly male and mostly occurs in outdoor public places and is often associated with road traffic accidents and blunt force, and there is little use of protective eyewear. The majority of injuries are anterior ocular in nature and are categorized as closed globe injuries, though a significant percentage of those injuries are accompanied by maxillofacial or head injuries, which is why multidisciplinary examination is required. Presentation visual status was quite variable, and prognostic scoring usually suggested an excellent chance of recovery. The management was conservative to a great extent and

surgery was necessitated in certain cases. Most patients at follow-up had satisfactory visual outcomes and severe visual impairment correlated more highly with open globe injuries highlighting the role played by injury type as a determinant of prognosis and the importance of preventive measures, early assessment, and timely intervention as a determinant of better visual outcomes.

References

1. Négrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiol 1998; 5:143 69.
2. Qayum S, Anjum R, Garg P. Epidemiological pattern of ocular trauma in a tertiary hospital of Northern India. Int J Biomed Res 2016; 7:420 2.
3. Krishnaiah S, Nirmalan PK, Shamanna BR, Srinivas M, Rao GN, Thomas R. Ocular trauma in a rural population of Southern India: The Andhra Pradesh Eye Disease Study. Ophthalmology 2006; 113:1159 64.
4. Vats S, Murthy GV, Chandra M, Gupta SK, Vashist P, Gogoi M. Epidemiological study of ocular trauma in an urban slum population in Delhi, India. Indian J Ophthalmol 2008; 56:313 6.
5. Park J, Yang SC, Choi HY. Epidemiology and clinical patterns of ocular trauma at a level 1 trauma center in Korea. J Korean Med Sci 2021;36: e5.
6. Kuhn F, Morris R, Witherspoon CD, Mester V. The Birmingham Eye Trauma Terminology system (BETT). J Fr Ophtalmol 2004; 27:206 10.
7. Kuhn F, Maisiak R, Mann L, Mester V, Morris R, Witherspoon CD. The Ocular Trauma Score (OTS). Ophthalmol Clin North Am 2002; 15:163 5, vi.
8. Belmonte Grau M, Garrido Ceca G, Marticorena Álvarez P. Ocular trauma in an urban Spanish population: Epidemiology and visual outcome. Int J Ophthalmol 2021; 14:1327 33.
9. Raiturcar TA, Naik PG, Cacodcar JA. Clinical profile and visual outcome of ocular injuries presenting at a tertiary care hospital in Goa. J Clin Ophthalmol Res 2019;7:41 4.
10. Magarakis M, Mundinger GS, Kelamis JA, Dorafshar AH, Bojovic B, Rodriguez ED. Ocular injury, visual impairment, and blindness associated with facial fractures: A systematic literature review. Plast Reconstr Surg 2012; 129:227 33.
11. Mohanty L, Bhayani J, Shah A, Patel N, Patel A. Clinical profile of ocular trauma in a tertiary care hospital of Southern Rajasthan. Int J Res Med Sci 2022; 10:127.
12. McGwin G Jr., Owsley C. Incidence of emergency department treated eye injury in the United States. Arch Ophthalmol 2005; 123:662 6.
13. Choovuthayakorn J, Worakriangkrai V, Patikulsila D, Watanachai N, Kunavisarut P, Chaikitmongkol V, et al. Epidemiology of eye injuries resulting in hospitalization, a referral hospital-based study. Clin Ophthalmol 2020; 14:1 6.
14. Voon LW, See J, Wong TY. The epidemiology of ocular trauma in Singapore: Perspective from the emergency service of a large tertiary hospital. Eye (Lond) 2001; 15:75 81.
15. Jain M, Radhakrishnan RV, Mohanty CR, Behera S, Singh AK, Sahoo SS, et al. Clinicoepidemiological profile of trauma patients admitting to the emergency department of a tertiary care hospital in Eastern India. J Family Med Prim Care 2020; 9:4974 9.
16. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. Helmets for preventing injury in motorcycle riders. Cochrane Database Syst Rev. 2008;1: CD004333.
17. Sasmal PK, Mohanty CR, Jain M, Radhakrishnan RV, Sahoo S, Krishna VS, et al. The effect of 'The Motor Vehicles (A Mendment) ACT, 2019' on the clinico epidemiological profile of road traffic accident patients presenting to a tertiary care trauma centre in Bhubaneswar. J Family Med Prim Care 2020; 9:3682 7.
18. Kinderan YV, Shrestha E, Maharjan IM, Karmacharya S. Pattern of ocular trauma in the Western region of Nepal. Nepal J Ophthalmol 2012; 4:5 9.