



Original Article

Presentation of Ocular Injuries in a Tertiary Care Hospital: A Hospital-Based Observational Study

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ABSTRACT

Background: Ocular trauma is an important cause of preventable visual morbidity and may result in injuries ranging from superficial ocular surface damage to devastating open-globe injuries with permanent visual loss. Occupational exposure, particularly in construction and manufacturing environments, is an important contributor to ocular trauma. Early presentation, accurate characterization of the injury, and appropriate surgical intervention are important determinants of prognosis.

Aim: To describe the demographic profile, mechanisms, clinical patterns, severity, and initial management of ocular injuries presenting to a tertiary care hospital.

Methods: A hospital-based observational analysis was performed using the available clinical records of 49 patients presenting with ocular injuries. Data regarding age, sex, occupation, residence, laterality, workplace, mechanism of injury, clinical pattern, time to presentation, presenting visual acuity, relative afferent pupillary defect (RAPD), Ocular Trauma Score (OTS), zone of injury, and surgical intervention were analyzed descriptively.

Results: The study included 49 patients with a mean age of 36.04 ± 12.30 years (range, 18–72 years). There was a marked male predominance, with 44 males (89.8%) and 5 females (10.2%). Thirty-one patients (63.3%) were from urban areas and 18 (36.7%) from rural areas. Construction workers constituted the largest occupational group (19/49; 38.8%), followed by factory workers (8/49; 16.3%) and helpers (6/49; 12.2%). The most frequent workplace setting was a construction site (20/49; 40.8%), followed by factories (14/49; 28.6%). Metallic objects were prominent mechanisms of injury. Iron nails were documented in 11 cases after normalization of duplicate terminology, followed by iron rods (5 cases), iron pieces (4 cases), blades/metal blades (5 cases), wooden pieces (3 cases), and stones (3 cases). Chemical injury was documented in four patients. The right eye was affected in 24 patients (49.0%), the left eye in 21 (42.9%), and both eyes in 4 (8.2%). Among the 34 cases in which the type of trauma was explicitly recorded, 25 (73.5%) were classified as open-globe/penetrating or globe-rupture injuries, 5 (14.7%) as closed-globe/blunt injuries, and 4 (11.8%) as chemical injuries. The mean OTS was 68.1 ± 19.4 . Among 48 patients with an available OTS, OTS category 2 was the most frequent (21 patients; 43.8%). Twenty-six patients (53.1%) presented within 6 hours of injury, while 8 (16.3%) presented between 6 and 24 hours. Delayed presentation beyond 7 days was documented in 7 patients (14.3%). Surgical intervention was recorded as performed in 33 patients. Corneal tear repair was the most frequently documented procedure.

Conclusion: Ocular trauma in this tertiary-care cohort predominantly affected young and middle-aged men and was strongly associated with occupational exposure, particularly construction and factory work. Open-globe and penetrating injuries constituted a substantial proportion of cases with an explicitly documented trauma type. Metallic objects were common causative agents, and corneal and

scleral injuries were frequent patterns requiring surgical intervention. The findings highlight the importance of workplace eye protection, early referral, standardized documentation, and prompt management of ocular trauma.

Keywords: *ocular trauma; ocular injury; open-globe injury; occupational eye injury; construction workers; Ocular Trauma Score; penetrating injury; tertiary care hospital.*

INTRODUCTION

Ocular trauma is a significant cause of visual impairment and can involve the globe, ocular adnexa, orbit, and visual pathways. The spectrum of injury ranges from minor conjunctival and corneal epithelial injuries to open-globe injuries, intraocular foreign bodies, traumatic cataract, retinal detachment, traumatic optic neuropathy, and endophthalmitis. Open-globe injuries are particularly important because they involve a full-thickness wound of the cornea and/or sclera and may result in severe and permanent visual morbidity.

The epidemiology of ocular trauma varies according to age, occupation, socioeconomic conditions, environmental exposure, and availability and use of protective equipment. Occupational ocular trauma is particularly relevant in construction and manufacturing settings, where workers are exposed to metallic fragments, sharp objects, projectiles, chemicals, and high-energy blunt trauma.

Standardized classification of ocular trauma is important for communication, documentation, treatment planning, and prognostication. The Birmingham Eye Trauma Terminology System (BETTS) distinguishes open-globe injuries from closed-globe injuries and further characterizes rupture, laceration, perforating injury, and associated lesions.

The Ocular Trauma Score (OTS), developed using large ocular trauma registries, provides a standardized method of estimating visual prognosis based on presenting visual acuity and additional prognostic variables such as globe rupture, endophthalmitis, perforating injury, retinal detachment, and RAPD.

The present study was undertaken to describe the pattern of ocular injuries presenting to a tertiary care hospital, with particular emphasis on demographic characteristics, occupational exposure, mechanism of injury, clinical presentation, severity, and initial management.

MATERIALS AND METHODS

Study design and setting

This was a hospital-based observational study based on the available clinical records of patients presenting with ocular injuries to a tertiary care hospital. The dataset contained records of 49 patients. As the supplied dataset did not specify the exact study period or hospital name, these details should be inserted in the final manuscript before submission.

Study variables

- Age and sex
- Occupation
- Urban or rural residence
- Laterality of ocular involvement
- Workplace or site of injury
- Mechanism of injury
- Clinical pattern of ocular injury
- Time from injury to presentation
- Presenting visual acuity
- Relative afferent pupillary defect
- Ocular Trauma Score
- Zone of injury
- Requirement for surgical intervention
- Type of surgical procedure

Data analysis

The available data were analyzed using descriptive statistics. Continuous variables were summarized using mean, standard deviation, median, and range where appropriate. Categorical variables were summarized using frequencies and percentages. Obvious duplicate terminology and spelling variations were consolidated where appropriate; missing variables were not imputed. Because the dataset was small and contained substantial missing information for certain variables, inferential statistical testing was not performed.

RESULTS

Demographic characteristics

A total of 49 patients were included. The mean age was 36.04 ± 12.30 years, with a median age of 35 years and a range of 18–72 years. There was a marked male predominance. Forty-four patients (89.8%) were male and five (10.2%) were female, giving a male-to-female ratio of approximately 8.8:1. Thirty-one patients (63.3%) were from urban areas, while 18 (36.7%) were from rural areas.

Variable	Number (%)
Total patients	49 (100)
Male	44 (89.8)
Female	5 (10.2)
Urban	31 (63.3)
Rural	18 (36.7)
Mean age $\pm$ SD	36.04 ± 12.30 years
Median age	35 years
Age range	18–72 years

Occupational profile

Construction workers constituted the largest occupational group, accounting for 19 patients (38.8%). Factory workers accounted for 8 patients (16.3%), followed by helpers in 6 (12.2%) and farmers in 5 (10.2%). The workplace distribution similarly demonstrated a predominance of occupational settings. Construction sites accounted for 20 cases (40.8%), followed by factories in 14 cases (28.6%). Fields accounted for 9 cases (18.4%), while garages accounted for 3 cases (6.1%).

Occupation	Number (%)
Construction worker	19 (38.8)
Factory worker	8 (16.3)
Helper	6 (12.2)
Farmer	5 (10.2)
Mechanic	3 (6.1)
Worker	3 (6.1)
Carpenter	1 (2.0)
Housekeeping	1 (2.0)
Painter	1 (2.0)
Homemaker	1 (2.0)
Others	1 (2.0)

Workplace	Number (%)
Construction site	20 (40.8)
Factory	14 (28.6)
Field	9 (18.4)
Garage	3 (6.1)
Shop	1 (2.0)
Office	1 (2.0)
House	1 (2.0)

Laterality

The right eye was involved in 24 patients (49.0%), the left eye in 21 (42.9%), and bilateral involvement was observed in 4 patients (8.2%).

Laterality	Number (%)
Right eye	24 (49.0)
Left eye	21 (42.9)
Bilateral	4 (8.2)

Mechanism of injury

Metallic objects were the most frequent mechanisms of injury. Iron-nail injuries were documented in 11 patients after consolidation of duplicate terminology. Iron rods were responsible for 5 injuries, iron pieces for 4, and blade or metal-blade injuries for 5 patients. Other mechanisms included wooden pieces, stones, screwdrivers, glass pieces, falls from or impact

with tractors, a coconut leaf, dried paint, and chemical exposure. Chemical injuries were documented in four patients, all involving bilateral ocular involvement in the available records.

Clinical pattern of injury

The clinical presentations were heterogeneous, reflecting the wide spectrum of ocular trauma. The most frequently documented individual clinical patterns were conjunctival congestion with corneal epithelial defect and stromal edema (4 patients), traumatic uveitis with total hyphema (3 patients), traumatic optic neuropathy (3 patients), and periorbital edema/ecchymosis associated with lower-lid or canalicular laceration (3 patients each). Open-globe presentations included corneal tears, corneoscleral tears, scleral tears, globe rupture, iris prolapse, intraocular foreign bodies, traumatic cataract, and tunnel wound injuries. Posterior segment involvement included retinal detachment, commotio retinae, and traumatic optic neuropathy in individual cases.

Type of trauma

The type of trauma was explicitly recorded in 34 of the 49 cases. Of these, 25 (73.5%) represented open-globe, penetrating, or globe-rupture injuries. Five cases (14.7%) were documented as closed-globe or blunt injuries and four (11.8%) as chemical injuries. These percentages are among cases with a documented trauma classification.

Type of trauma	Number	% among documented cases
Penetrating	9	26.5
Open globe	8	23.5
Open globe penetrating	4	11.8
Globe rupture	3	8.8
Open globe rupture	1	2.9
Closed globe blunt trauma	3	8.8
Closed globe contusion	1	2.9
Blunt trauma	1	2.9
Chemical injury	4	11.8
Total	34	100

Time to presentation

Time to presentation was available for 47 patients. Twenty-six patients (55.3%) presented within 6 hours of injury, while 8 (17.0%) presented between 6 and 24 hours. Five patients presented between 2 and 7 days, while seven patients presented more than 7 days after injury. The latter included presentations as late as 20 days and 1 month.

Time to presentation	Number (%) among documented cases
≤6 hours	26 (55.3)
>6–24 hours	8 (17.0)
>24–48 hours	1 (2.1)
>2–7 days	5 (10.6)
>7 days	7 (14.9)
Total	47 (100)

Presenting visual acuity and RAPD

Presenting visual acuity was recorded using a mixture of Snellen notation, counting fingers, hand movements, and perception of light. The dataset therefore does not permit reliable calculation of a single standardized LogMAR distribution without reclassification of individual visual acuity entries. The most frequently documented visual acuity was 6/18 in 8 patients and hand movements positive in 8 patients. Three patients had positive perception of light and three had light perception without further specification. RAPD was explicitly documented in four patients, while 41 had nil recorded.

Ocular Trauma Score

The Ocular Trauma Score was available for 48 patients. The mean OTS was 68.06 ± 19.38 , with a median of 60 and a range of 35–100. Category 2 was the most frequent, occurring in 21 patients (43.8%), followed by category 3 in 8 (16.7%), category 4 in 10 (20.8%), category 5 in 4 (8.3%), and category 1 in 5 (10.4%).

OTS category	OTS range	Number (%)
Category 1	0–44	5 (10.4)
Category 2	45–65	21 (43.8)
Category 3	66–80	8 (16.7)
Category 4	81–91	10 (20.8)
Category 5	92–100	4 (8.3)
Total		48 (100)

Zone of injury

Zone of injury was recorded in 34 patients. Zone 1 was the most commonly documented zone, occurring in 22 patients. Zone 2 was documented in 9 patients, while combined Zone 1 and Zone 2 involvement was documented in 2 patients. One record was marked as nil. The predominance of Zone 1 injuries is consistent with the high frequency of corneal wounds in the present cohort.

Surgical intervention

Surgical intervention was documented as performed in 33 of 44 patients with a recorded intervention status (75.0%). Eleven patients were recorded as not requiring surgery. Corneal tear repair was the most frequent surgical procedure, performed in 12 cases. Scleral tear repair was performed in 4 cases. Other procedures included lower-lid canalicular tear repair, corneoscleral tear repair, foreign-body removal, intraocular foreign-body removal, tunnel wound suturing with IOL explantation, lid laceration repair, globe exploration, cataract surgery, and anterior chamber wash.

Procedure	Number
Corneal tear repair	12
Scleral tear repair	4
IOL explantation with tunnel suturing	3
Lower-lid canalicular tear repair	3
Corneoscleral tear repair	2
Corneal tear with foreign-body removal	2
Corneal tear repair with foreign-body removal	1
Corneal tear repair with intracameral foreign-body removal	1
Lid laceration repair	1
Cataract surgery	1
Foreign-body removal with glue	1
Globe exploration	1
Scleral tear repair with anterior chamber wash	1

DISCUSSION

The present study demonstrates that ocular trauma presenting to a tertiary care hospital predominantly affected young and middle-aged males, with a mean age of approximately 36 years and a male-to-female ratio of 8.8:1. This pattern is consistent with the broader epidemiology of ocular trauma, where males frequently predominate, particularly in occupational and mechanical injuries.

An important finding was the prominent occupational association. Construction workers accounted for nearly 40% of the cohort, and construction sites were the most frequently represented workplace. Factory workers constituted another substantial group. Construction and manufacturing environments expose workers to high-velocity metallic fragments, sharp objects, projectiles, and other mechanical hazards.

Metallic objects were the most common recorded mechanisms. Iron nails, rods, iron pieces, blades, and other metal objects accounted for a large proportion of injuries. Such mechanisms can produce full-thickness corneal or scleral wounds, intraocular foreign bodies, traumatic cataract, and other severe ocular complications.

A substantial proportion of cases with documented trauma classification were open-globe or penetrating injuries. Open-globe injuries involve a full-thickness wound of the cornea and/or sclera. The clinical spectrum in this cohort included corneal and corneoscleral tears, scleral tears, globe rupture, iris prolapse, intraocular foreign bodies, traumatic cataract, and posterior segment injury.

More than half of the patients with documented presentation time reached the hospital within six hours of injury. Nevertheless, a clinically important subgroup presented after substantial delay. Delayed presentation in open-globe injuries is concerning because prolonged exposure to environmental contamination and delayed wound closure may increase the risk of complications and poor visual outcome.

The Ocular Trauma Score provided an additional measure of injury severity. The mean OTS was approximately 68, with category 2 being the most common category. The OTS is an established prognostic tool for ocular trauma and provides standardized prognostic information based on presenting visual acuity and important clinical factors.

The high proportion of patients requiring surgery reflects the severity of injuries managed at the tertiary center. Corneal tear repair was the most frequently performed procedure, consistent with the predominance of Zone 1 injuries and corneal

wounds. The need for scleral repair, foreign-body removal, IOL explantation, canalicular repair, and globe exploration demonstrates the heterogeneous nature of ocular trauma.

The strong association with construction and factory work has important preventive implications. Appropriate protective eyewear, engineering controls, worker education, and early referral pathways may reduce both the incidence and severity of occupational ocular injuries.

Limitations

This study has several limitations. First, the sample size was small, with only 49 patients. Second, the dataset did not include the study period, hospital name, follow-up duration, or final visual acuity, limiting assessment of visual outcomes and temporal trends. Third, several variables contained missing observations, particularly trauma classification and zone of injury.

Presenting visual acuity was recorded using heterogeneous notation, including Snellen fractions, counting fingers, hand movements, and perception of light. Therefore, direct conversion to LogMAR without verification from the original clinical records may introduce error. There was also inconsistency in terminology and spelling within the original database. Finally, because this was a descriptive analysis, relationships between mechanism, OTS, timing of presentation, surgical intervention, and final visual outcome could not be statistically assessed.

CONCLUSION

Ocular injuries presenting to this tertiary care hospital predominantly affected young and middle-aged men and were strongly associated with occupational exposure. Construction sites and factories accounted for the majority of documented workplace injuries, with metallic objects being the most frequent mechanisms.

Among cases with documented trauma classification, open-globe and penetrating injuries constituted the majority. Corneal and scleral wounds were common, and most patients with a documented intervention status required surgical treatment. Although more than half of the patients presented within six hours, a clinically important proportion had delayed presentation.

The findings emphasize the need for effective occupational eye-safety measures, early recognition and referral of ocular trauma, standardized documentation using accepted trauma classification systems, and prompt surgical management of open-globe injuries. Larger prospective studies with standardized visual acuity recording and longitudinal follow-up are required to determine prognostic factors and final visual outcomes in this population.

Declarations

Ethics approval

Ethics committee approval should be added according to the actual institutional protocol before submission.

Consent

The requirement for informed consent should be stated according to the institutional ethics committee and the study design.

Conflict of interest

The authors should declare any relevant conflicts of interest.

Funding

The source of funding, if any, should be specified.

Data availability

The data underlying this study should be made available according to institutional policy and applicable ethical requirements.

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