



## A PROSPECTIVE CLINICAL STUDY FOR EVALUATION AND MANAGEMENT OF OCULAR TRAUMA PATIENTS IN A TERTIARY EYE CARE CENTRE

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### ABSTRACT

Ocular trauma is a major and preventable cause of visual morbidity and blindness worldwide, disproportionately affecting young, economically productive individuals. This prospective hospital-based study evaluated the clinical profile, management, and visual outcomes of 250 patients presenting with ocular trauma to a tertiary eye care centre over one year. Patients underwent detailed ophthalmic examination, and outcomes were assessed at six months of follow-up. The majority of patients belonged to the 21–30-year age group (31.6%), with marked male predominance (83.2%). Road traffic accidents were the leading cause of injury (54.0%), and closed-globe injuries predominated (86.4%) over open-globe injuries (13.6%,  $p < 0.001$ ). The eyelid (44.0%) and conjunctiva (39.6%) were the most commonly involved structures. At six months, 79.6% of patients achieved normal visual acuity, while 12.8% progressed to blindness. Type of injury, Ocular Trauma Score (OTS), zone of injury, initial visual acuity, and tear size emerged as significant predictors of final visual outcome ( $p < 0.001$ ). Most patients (77.6%) were managed conservatively. Early presentation, accurate initial assessment, and prompt appropriate management are critical to improving visual prognosis. Preventive strategies such as enforcement of road safety measures and use of protective eyewear are essential to reducing the burden of ocular trauma.

**KEYWORDS :** ocular trauma, visual outcome, road traffic accident, Ocular Trauma Score, tertiary eye care

### INTRODUCTION

Ocular trauma remains a major public health concern worldwide and a significant cause of preventable visual impairment and blindness.<sup>[1,2]</sup> Owing to its exposed anatomical position, the eye is particularly vulnerable to traumatic insults, with injuries ranging from minor superficial lesions to severe globe-disrupting damage. Ocular trauma predominantly affects the younger, economically productive age group, with males more commonly affected, and road traffic accidents, occupational hazards, domestic injuries, sports-related trauma, and assault among the leading causes.

India represents a high-risk setting for ocular trauma, with disparities in healthcare access and awareness contributing to variable outcomes. Standardized systems such as the Birmingham Eye Trauma Terminology (BETT) and the Ocular Trauma Score (OTS) facilitate uniform documentation and prognostication.<sup>[3]</sup> Prospective clinical evaluation from presentation through follow-up is essential for identifying prognostic indicators and improving trauma care delivery. The present study was undertaken to analyse the clinical profile, injury patterns, management modalities, and visual outcomes in patients presenting with ocular trauma to a tertiary eye care centre.

### Aims and Objectives: (

1) To study the demographic and epidemiological profile of patients with ocular trauma; (2) To analyse the mode, type, and structures involved in injury; (3) To evaluate clinical presentation and ocular findings; (4) To determine visual outcomes.

A brief review of literature indicates that ocular trauma studies from various tertiary centres across India have consistently reported a strong male preponderance and a predilection for the young adult age group, with road traffic accidents as the leading aetiology [4-8]. Standardized injury-scoring systems such as BETT and OTS have been widely validated across these studies as reliable tools for predicting final visual outcome,<sup>[3]</sup> underscoring the value of incorporating them into routine clinical assessment of ocular trauma patients.

### MATERIALS AND METHODS

This prospective hospital-based study was conducted over one year (April 2024–March 2025), after institutional ethical approval. A total of 250 patients with ocular trauma to one or both eyes were enrolled based on a calculated sample size (prevalence 2.4%, absolute error 2%). Patients with renal/hepatic failure, pregnancy, drug allergy, or poor general condition were excluded.

After informed consent, a detailed history and comprehensive ocular examination (visual acuity, intraocular pressure, slit-lamp examination, direct and indirect ophthalmoscopy) were performed, along with B-scan ultrasonography, X-ray, and CT/MRI as indicated. Injuries were classified using BETT and OTS. Patients were managed medically or surgically as required and followed up at 3 and 6 months, with repeat comprehensive ocular examination at each visit to document structural and visual recovery. Data were analysed using SPSS v23; Chi-square tests were applied for qualitative associations, with  $p < 0.05$  considered statistically significant and  $p < 0.001$  considered highly significant.

### OBSERVATIONS AND RESULTS

Of the 250 patients studied, the majority belonged to the 21–30-year age group (31.6%), followed by 31–40 years (20.0%). Males constituted 83.2% of the study population.

**Table 1: Demographic Profile of Study Population (n = 250)**

| Variable  | Category  | Frequency | Percentage (%) |
|-----------|-----------|-----------|----------------|
| Age Group | 0–10 yrs  | 21        | 8.4            |
|           | 11–20 yrs | 40        | 16.0           |
|           | 21–30 yrs | 79        | 31.6           |
|           | 31–40 yrs | 50        | 20.0           |
|           | 41–50 yrs | 32        | 12.8           |
|           | > 50 yrs  | 28        | 11.2           |
| Gender    | Male      | 208       | 83.2           |
|           | Female    | 42        | 16.8           |

Source: Study data (n = 250)

Road traffic accidents (RTA) were the most common mode of injury (54.0%), followed by other causes (20.0%) and assault (11.2%). Closed-globe injuries accounted for 86.4% of cases, significantly more common than open-globe injuries (13.6%,  $p < 0.001$ ). The eyelid (44.0%) and conjunctiva (39.6%) were the

most frequently involved structures.

Table 2: Mode of Injury and Type of Ocular Injury (n=250)

| Variable       | Category       | Frequency | Percentage (%) |
|----------------|----------------|-----------|----------------|
| Mode of Injury | RTA            | 135       | 54.0           |
|                | Assault        | 28        | 11.2           |
|                | Fall           | 20        | 8.0            |
|                | Animal-related | 8         | 3.2            |
|                | Burn           | 9         | 3.6            |
| Type of Injury | Others         | 50        | 20.0           |
|                | Closed globe   | 216       | 86.4           |
|                | Open globe     | 34        | 13.6           |

Source: Study data (n=250); p<0.001 for type of injury

At six months follow-up, 79.6% of patients achieved normal visual acuity (6/6–6/9), 7.6% had visual impairment, and 12.8% developed blindness (CF–No PL). Most patients (77.6%) were managed conservatively, while 22.4% required surgical intervention.

Table 3: Final Visual Outcome at 6 Months (n=250)

| Outcome           | VA Range   | Frequency | Percentage (%) |
|-------------------|------------|-----------|----------------|
| Normal            | 6/6–6/9    | 199       | 79.6           |
| Visual Impairment | 6/12–<3/60 | 19        | 7.6            |
| Blindness         | CF–No PL   | 32        | 12.8           |

Source: Study data (n=250)

Type of injury, OTS category, zone of injury, initial visual acuity, and tear size were all significantly associated with final visual outcome (p<0.001 for each). Closed-globe injuries and higher OTS (category 5) were associated with favourable outcomes (198 and 185 cases achieving normal vision, respectively), whereas open-globe injuries, Zone 3 involvement, and tear size ≥ 5 mm were associated with poor outcomes, including all cases of blindness in the ≥ 5 mm tear group.

Table 4: Association Between Type of Injury and Final Visual Outcome (n=250)

| Type of Injury | 6/6–6/9 | 6/12–<3/60 | CF–No PL | Total |
|----------------|---------|------------|----------|-------|
| Closed globe   | 198     | 14         | 4        | 216   |
| Open globe     | 1       | 5          | 28       | 34    |
| Total          | 199     | 19         | 32       | 250   |

Source: Study data; p<0.001

Patients with higher OTS category (5) demonstrated excellent visual outcomes, with 185 of 187 cases achieving normal vision, whereas lower OTS categories (1–2) were strongly associated with poor outcomes, including all 32 cases of blindness in this study (p<0.001).

Table 5: Association Between Ocular Trauma Score (OTS) and Final Visual Outcome (n=250)

| OTS Category | 6/6–6/9 | 6/12–<3/60 | CF–No PL | Total |
|--------------|---------|------------|----------|-------|
| 1–2          | 0       | 4          | 32       | 36    |
| 3            | 2       | 7          | 0        | 9     |
| 4            | 12      | 6          | 0        | 18    |
| 5            | 185     | 2          | 0        | 187   |
| Total        | 199     | 19         | 32       | 250   |

Source: Study data; p<0.001

DISCUSSION

The demographic profile observed in this study predominance of young adult males is consistent with existing literature. Kanoje et al. (2024) [5] reported 77.47% male predominance with peak incidence in the 21–30-year age group, while Sao et al. (2022) [6] and Jain et al. (2015) [7] reported similarly high male predominance (83% and 81% respectively), supporting increased occupational and outdoor exposure among males as a contributing factor.

Road traffic accidents as the leading cause of ocular trauma (54.0% in this study) parallels findings by Sao et al. (2022) [6] (54%), though Sahu et al. (2022) [4] and Rana et al. (2025) [8] reported higher proportions (67.7% and 72%), likely reflecting differences in road safety infrastructure and helmet/seatbelt compliance across study populations.

The predominance of closed-globe injuries (86.4%) is comparable to Jain et al. (2015) [7] (80.88%) and Sahu et al. (2022) [4] (87.7%), reflecting a higher incidence of blunt trauma from RTAs and minor mechanical injuries affecting superficial structures without full-thickness globe disruption. Open-globe injuries, though less frequent, disproportionately contributed to poor visual outcomes, consistent with their association with more extensive structural damage and complications such as endophthalmitis.

The favourable visual outcome observed in 79.6% of patients at six months aligns with reports by Kanoje et al. (2024), [5] who similarly found significant visual improvement, particularly among patients with less severe injuries. The identification of OTS, initial visual acuity, zone of injury, and tear size as strong prognostic indicators reinforces the clinical utility of standardized scoring systems in guiding management and counselling patients on expected visual prognosis.

Laterality of injury also showed a significant association with visual outcome (p=0.003), with right-eye injuries associated with a higher number of blindness cases, while bilateral involvement was, interestingly, associated with favourable outcomes overall. Tear size emerged as a particularly strong prognostic marker, with all patients having tear size ≥ 5 mm progressing to blindness, compared to predominantly favourable outcomes among those with tears < 5 mm (p<0.001). These findings collectively highlight that a combination of clinical and scoring parameters rather than any single variable should guide prognostication and counselling in ocular trauma. The relatively high proportion of conservatively managed patients (77.6%) in this study further suggests that timely, non-surgical intervention is often sufficient when injuries are recognised and treated early, reserving surgery for more severe, vision-threatening presentations.

Limitations of this study include its single-centre hospital-based design, a follow-up period restricted to six months, and a moderate sample size, all of which may limit generalisability and the capture of late complications. Larger multicentric studies with longer follow-up are recommended to further validate these prognostic associations.

CONCLUSION

Ocular trauma predominantly affects young adult males, with road traffic accidents as the leading preventable cause. While closed-globe injuries generally carry a favourable prognosis, open-globe injuries, low OTS, posterior segment (Zone 3) involvement, poor initial visual acuity, and larger tear size are significant predictors of poor visual outcome. Early presentation, prompt standardized assessment using OTS, and timely appropriate management are essential to optimizing visual outcomes. Preventive strategies, particularly road safety enforcement and protective eyewear use, are critical to reducing the burden of ocular trauma.

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