International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-4-119*

A Study of Ocular Manifestations in Patients with Head Injury Admitted Under General Surgery.

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Received: 24-03-2026
Revised: 20-04-2026
Accepted: 27-04-2026
Published: 30-04-2026

Abstract

Background: Head injury is frequently accompanied by ocular and neuro-ophthalmic abnormalities because of the anatomical proximity of the orbit, globe, optic nerve, cranial nerves, and intracranial structures. Early recognition is important to reduce preventable visual morbidity. ***Objectives:*** To evaluate the pattern of ocular manifestations among patients with head injury admitted under General Surgery and to assess their association with severity of head injury. ***Methods:*** This hospital-based observational study included 50 patients with head injury admitted at RVM Institute of Medical Sciences and Research Center, Laxmakkapally, Mulugu Mandal, Siddipet District, Telangana, India, from August 2025 to January 2026. Demographic profile, mode of injury, Glasgow Coma Scale grading, ocular findings, visual acuity, fundus findings, and clinical outcome were recorded using a structured proforma. Data were analysed using descriptive statistics and chi-square test. ***Results:*** The mean age was 36.8 +/- 15.4 years, and males constituted 74% of cases. Road traffic accident was the commonest mechanism of injury. Ocular manifestations were observed in 64% of patients. Periorbital ecchymosis was the most frequent finding, followed by subconjunctival haemorrhage, lid oedema or laceration, pupillary abnormality, and orbital fracture. Visual impairment was documented in 54% of patients at presentation. Ocular involvement increased with injury severity and was highest among severe head injury cases. Complete recovery or clinical improvement was observed in most patients. ***Conclusion:*** Ocular manifestations were common among patients with head injury, particularly in moderate and severe injuries. Routine early ophthalmic assessment in general surgery trauma admissions helps identify vision-threatening and neuro-ophthalmic complications requiring timely referral and follow-up.

Keywords: Head injury; ocular manifestations; periorbital ecchymosis; subconjunctival haemorrhage; Glasgow Coma Scale; traumatic optic neuropathy; orbital fracture.

INTRODUCTION

Traumatic head injury remains an important cause of emergency admission, disability, and mortality worldwide. Its burden is particularly high in low- and middle-income settings, where road traffic accidents, occupational trauma, interpersonal violence, and falls contribute substantially to neurosurgical and general surgical admissions [1,2]. Although initial management appropriately focuses on airway, breathing, circulation, intracranial injury, and associated systemic trauma, the eye and visual pathways are vulnerable during the same traumatic event. The orbit, adnexa, globe, optic nerve, ocular motor nerves, and intracranial visual pathways are closely related to the craniofacial skeleton; therefore, even a closed head injury can produce clinically relevant ocular findings.

Ocular manifestations after head injury range from minor adnexal signs to sight-threatening posterior segment and neuro-ophthalmic complications. Periorbital ecchymosis, lid oedema, lid laceration, subconjunctival haemorrhage, corneal abrasion, pupillary abnormality, ocular motility restriction, orbital fracture, retinal haemorrhage, and traumatic optic neuropathy have been described in previous clinical studies [5-8]. These findings are not merely cosmetic. Pupillary

involvement, papilloedema, cranial nerve palsy, and optic nerve injury can indicate severe intracranial or orbital trauma and can influence prognosis. Conversely, apparently minor signs such as subconjunctival haemorrhage or periorbital swelling can coexist with orbital wall fractures or occult ocular surface injury.

Several studies have shown that ocular involvement is more frequently detected when ophthalmic evaluation is performed systematically rather than only after patient-reported visual complaints [5-8]. This point is clinically relevant because patients with altered sensorium, pain, facial swelling, or associated injuries are often unable to report blurred vision, diplopia, field defects, or ocular pain. The Glasgow Coma Scale remains a practical tool for grading the neurological severity of head injury and is useful for correlating ocular findings with the level of consciousness and systemic trauma severity [4]. Earlier recognition of visual pathway involvement can guide timely referral, imaging, treatment, counselling, and follow-up.

In general surgery trauma units, ophthalmic manifestations are sometimes documented late because life-threatening injuries receive priority during the initial resuscitation phase. However, a focused ocular assessment can be integrated into routine trauma evaluation without delaying emergency care. The present study was conducted with the objective of assessing the frequency and pattern of ocular manifestations among patients with head injury admitted under General Surgery, and to evaluate the association between ocular manifestations and the severity of head injury as graded by the Glasgow Coma Scale.

METHODOLOGY

Study design and setting

This hospital-based observational study was conducted among patients with head injury admitted under the Department of General Surgery at RVM Institute of Medical Sciences and Research Center, Laxmakkapally, Mulugu Mandal, Siddipet District, Telangana, India. The study was carried out over six months, from August 2025 to January 2026. The study design was selected to describe the clinical spectrum of ocular findings in routine trauma admissions and to correlate these findings with neurological severity.

Study population and sample size

A total of 50 consecutive eligible patients with head injury were included. Patients of either sex admitted with a clinical diagnosis of head injury during the study period were considered for enrolment after initial stabilization. The study population represented patients managed under General Surgery, including those requiring multidisciplinary opinion from ophthalmology, radiology, neurosurgery, or other specialties according to clinical need.

Eligibility criteria

Patients with acute head injury admitted during the study period and fit for ocular examination were included. Patients with pre-existing severe ocular disease affecting visual acuity, previous ocular trauma, media opacity preventing baseline assessment unrelated to the present injury, isolated ocular trauma without head injury, and patients or attendants unwilling to provide consent were excluded. In unconscious or severely injured patients, relevant history was obtained from relatives or attendants.

Clinical assessment

Demographic details, mode of injury, time since trauma, and associated clinical features were recorded in a predesigned proforma. Severity of head injury was graded using the Glasgow Coma Scale as mild, moderate, or severe [4]. Ocular assessment included inspection of eyelids and adnexa, conjunctival and corneal examination, pupillary reaction, ocular movement assessment, bedside visual acuity when feasible, anterior segment examination, and fundus evaluation. Orbital or cranial imaging findings were noted wherever performed for clinical indications. The approach was aligned with previous head injury studies that emphasized structured ophthalmic evaluation during trauma care [5-8].

Outcome measures and statistical analysis

The primary outcome was the presence of any ocular manifestation among patients with head injury. Secondary outcomes included the type of ocular finding, visual acuity status, posterior segment findings, relationship with head injury severity, and clinical outcome at discharge or follow-up. Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages. Continuous variables were summarized as mean and standard deviation. Association between severity of head injury and ocular manifestations was assessed using the chi-square test. A p-value less than 0.05 was considered statistically significant.

Ethical considerations

Institutional ethical approval was obtained before initiation of the study. Written informed consent was obtained from conscious patients or from legally acceptable attendants where the patient was not able to provide consent. Patient

confidentiality was maintained throughout data collection and analysis. The study involved routine clinical evaluation and did not interfere with emergency treatment priorities.

RESULTS

A total of 50 patients with head injury admitted under General Surgery were included in the study. The mean age of the study population was 36.8 +/- 15.4 years. Most patients were in the 21-40 years age group. Males were predominant, accounting for 74% of cases. Road traffic accident was the most common mode of injury. Mild head injury was observed in 42%, moderate head injury in 36%, and severe head injury in 22% of patients (Table 1).

Table 1. Baseline demographic and injury profile of patients with head injury

Variable	Category	Frequency (n=50)	Percentage (%)
Age group	<=20 years	8	16.0
	21-40 years	22	44.0
	41-60 years	14	28.0
	>60 years	6	12.0
Gender	Male	37	74.0
	Female	13	26.0
Mode of injury	Road traffic accident	31	62.0
	Fall from height	12	24.0
	Assault	5	10.0
	Others	2	4.0
Severity of head injury	Mild	21	42.0
	Moderate	18	36.0
	Severe	11	22.0

Ocular manifestations were observed in 32 patients, giving an overall prevalence of 64%. Periorbital ecchymosis was the most common ocular finding, followed by subconjunctival haemorrhage and lid oedema or laceration. Pupillary abnormalities were present in 24% of patients, while orbital fracture was detected in 16% of cases. Less frequent but clinically important findings included restricted ocular movements, cranial nerve palsy, traumatic optic neuropathy, and retinal or vitreous haemorrhage (Table 2).

Table 2. Pattern of ocular manifestations among patients with head injury

Ocular manifestation	Frequency (n=50)	Percentage (%)
Any ocular manifestation	32	64.0
Periorbital ecchymosis	24	48.0
Subconjunctival haemorrhage	16	32.0
Lid oedema/laceration	14	28.0
Pupillary abnormality	12	24.0
Orbital fracture	8	16.0
Corneal abrasion	6	12.0
Restricted ocular movements	6	12.0
Cranial nerve palsy	5	10.0
Traumatic optic neuropathy	3	6.0
Retinal/vitreous haemorrhage	2	4.0

Note: Multiple ocular manifestations were present in some patients; therefore, individual findings exceed the number of patients with any ocular manifestation.

Visual acuity was normal in 46% of patients at presentation. Mild visual impairment was observed in 30%, while moderate and severe visual impairment were noted in 16% and 8% of patients, respectively. Fundus examination was normal in most cases. Retinal haemorrhage, vitreous haemorrhage, and optic disc oedema or pallor were less frequent posterior segment findings. In two patients, the fundus could not be visualized adequately because of media or clinical limitations (Table 3).

Table 3. Visual acuity and posterior segment findings

Parameter	Category	Frequency (n=50)	Percentage (%)
Visual acuity status	Normal	23	46.0
	Mild visual impairment	15	30.0
	Moderate visual impairment	8	16.0
	Severe visual impairment	4	8.0
Fundus findings	Normal fundus	42	84.0
	Retinal haemorrhage	2	4.0
	Vitreous haemorrhage	1	2.0
	Optic disc oedema/pallor	3	6.0
	Fundus not visualized	2	4.0

Ocular manifestations increased with the severity of head injury. They were present in 47.6% of patients with mild head injury, 66.7% with moderate head injury, and 90.9% with severe head injury. This association was statistically significant. At discharge or follow-up, 48% of patients had complete recovery or no residual ocular finding, while 36% showed clinical improvement. Persistent ocular deficit was observed in 10% of patients, and 6% required specialist ophthalmic management (Table 4).

Table 4. Association of ocular manifestations with severity of head injury and clinical outcome

Parameter	Category	Frequency/Total	Percentage (%)	p-value
Severity of head injury with ocular manifestations	Mild	10/21	47.6	0.041
	Moderate	12/18	66.7	
	Severe	10/11	90.9	
Clinical outcome	Complete recovery/no residual finding	24/50	48.0	-
	Clinical improvement	18/50	36.0	
	Persistent ocular deficit	5/50	10.0	
	Referred for specialist ophthalmic management	3/50	6.0	

Overall, ocular manifestations were common among patients with head injury. Most findings involved the eyelids, conjunctiva, and periorbital region, while neuro-ophthalmic complications were less frequent but clinically significant. The frequency of ocular involvement was higher in patients with moderate and severe head injury.

DISCUSSION

The present study observed ocular manifestations in 64% of patients with head injury admitted under General Surgery. This finding confirms that ocular involvement is a frequent component of head trauma and supports the need for routine ocular screening in trauma admissions. Previous studies have reported variable frequencies of ocular findings after head injury, ranging from lower proportions in broad neurosurgical admissions to higher proportions when systematic ophthalmic examination is performed [5-8]. Differences in study setting, timing of examination, injury mechanism, and inclusion criteria explain this variation.

Young adults and males formed the major proportion of the present study population. This pattern is comparable with earlier reports in which economically active males were disproportionately affected because of greater outdoor exposure, travel, and road traffic risk [1,2,5,8]. Road traffic accident was the leading mechanism of injury in the current study, accounting for 62% of cases. This observation is consistent with studies by Kulkarni et al. and Pattnaik et al., where road traffic accidents constituted the principal cause of head injury-associated ocular morbidity [5,8].

Periorbital ecchymosis was the most common ocular manifestation in this study, followed by subconjunctival haemorrhage and lid oedema or laceration. A similar predominance of adnexal and anterior segment findings has been described by Odebode et al. and Sharma et al. [6,7]. These lesions are usually visible during primary examination, yet their clinical significance should not be underestimated. Periorbital ecchymosis and subconjunctival haemorrhage can reflect blunt orbital impact, skull base injury, or associated orbital fracture depending on the clinical context. Corneal abrasion and lid injuries also require timely management to prevent secondary infection, exposure-related epithelial damage, and avoidable discomfort.

Pupillary abnormality was observed in 24% of patients and showed clinical relevance because such findings can indicate optic nerve trauma, ocular motor nerve involvement, or raised intracranial pressure. Prior literature has emphasized that pupillary involvement, papilloedema, ocular motor paresis, and traumatic optic neuropathy are more concerning than superficial adnexal injuries [5,7,9-12]. In the present study, traumatic optic neuropathy was documented in 6% and cranial nerve palsy in 10% of patients. Though these frequencies were lower than minor external findings, they represent important causes of persistent visual deficit and need careful follow-up.

A statistically significant increase in ocular manifestations was found with increasing head injury severity. Ocular involvement was present in 47.6% of mild, 66.7% of moderate, and 90.9% of severe head injury cases. This graded relationship agrees with prior observations that ocular signs correlate with neurological severity and adverse prognosis [5,7,8]. The finding supports the practical role of the Glasgow Coma Scale not only as a neurological grading tool but also as a marker for the likelihood of ocular and neuro-ophthalmic involvement [4]. Most patients improved clinically; however, persistent deficit was seen in patients with neuro-ophthalmic or structural orbital findings. Therefore, early multidisciplinary collaboration between General Surgery, Ophthalmology, Radiology, and Neurosurgery remains essential for preserving both life and vision in head injury patients [9,13,14].

Limitations

This study was conducted in a single centre with a sample size of 50 patients, limiting broader generalization. Follow-up duration was short, so delayed neuro-ophthalmic deficits and long-term visual recovery were not fully assessed. Detailed imaging and advanced ophthalmic investigations were performed according to clinical indication, resulting in variable availability of confirmatory findings.

CONCLUSION

Ocular manifestations were observed in nearly two-thirds of patients with head injury admitted under General Surgery. Periorbital ecchymosis, subconjunctival haemorrhage, lid oedema or laceration, pupillary abnormality, and orbital fracture were the common findings. Neuro-ophthalmic complications such as cranial nerve palsy and traumatic optic neuropathy were less frequent but clinically important because of their association with persistent visual morbidity. Ocular involvement increased significantly with the severity of head injury. These findings highlight the need for early structured ocular assessment in all head injury patients, particularly those with moderate or severe injury, altered sensorium, pupillary abnormality, orbital signs, or visual complaints.

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