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Research Article

Clinical Profile Of Patients With Ocular Trauma In A Tertiary Care Hospital: A Retrospective Study.

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Abstract: ***Introduction:*** Ocular trauma is a leading global cause of preventable visual morbidity, especially in low- and middle-income countries. Understanding regional injury patterns is essential for improving clinical protocols and developing targeted preventive strategies. This study's aim is to determine the clinical profile of ocular trauma patients presenting to a tertiary care hospital. ***Methodology:*** This retrospective, hospital-based observational study analyzed 60 patients with ocular trauma at the Government Regional Eye Hospital, Visakhapatnam, between January and June 2025. Data on demographics, etiology, clinical findings (BETT classification), management, and visual outcomes were extracted from medical records and analyzed using descriptive and inferential statistic. ***Results:*** The study has a significant male predominance (75%), with the 20–40 age group most frequently affected (43.3%). Road traffic accidents (RTAs) were the primary cause of injury (35%). Closed globe injuries (68.3%) were more common than open globe injuries (31.7%), with the left eye involved in 53.3% of cases. Hyphema (35%) and traumatic cataract (26.7%) were the most frequent clinical finding and complication, respectively. While 61.7% of patients required surgical intervention, there was a statistically significant improvement in post-treatment Visual acuity (p = 0.001), with "good vision" (>6/18) increasing from 20% to 46.7%. ***Conclusion:*** Ocular trauma predominantly impacts young, economically productive males in urban settings, primarily due to Road Traffic accidents. Although timely surgical and medical intervention significantly improves visual outcomes, the high rate of severe injuries highlights the urgent need for Urgent public awareness campaigns and stricter road safety enforcements to reduce presentation delays.

Keywords: Ocular trauma, Eye injuries, Road traffic accidents, Closed globe injury, Open globe injury.

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INTRODUCTION

Ocular trauma is a leading cause of preventable visual morbidity worldwide, with 55 million eye injuries occurring annually.1,2 In low- and middle-income countries (LMICs), ocular injuries are more prevalent due to occupational hazards, inadequate safety measures, and delayed access to healthcare.3,4 The Birmingham Eye Trauma Terminology System classifies injuries as closed globe (contusions, lamellar lacerations) or open globe (penetrating, perforating, intraocular foreign body, globe rupture), each requiring specific management.5,6

To better understand this burden and improve clinical outcomes, retrospective studies that analyze patient records help identify injury patterns, risk factors, and visual outcomes.7,8 Tertiary care centres, which serve as referral hubs for complex cases, provide comprehensive data on moderate to severe trauma cases, which are instrumental in identifying high-risk populations and improving management protocols.9,10,11

Despite the significant impact of ocular trauma, recent epidemiological data remains limited, particularly from developing regions. This study aim is to analyse the clinical profile, etiological patterns, and outcomes of ocular trauma patients in a tertiary care hospital. The findings will contribute to epidemiological knowledge and help formulate preventive measures and improved clinical protocols in similar settings.

Aim:

- To determine the clinical profile of patients with ocular trauma presenting to a tertiary care hospital over a defined period through retrospective analysis.

Objectives:

- To determine the demographic distribution of ocular trauma cases.
- To classify the types and causes of ocular trauma.
- To assess the clinical severity and anatomical involvement.
- To evaluate visual outcomes and the types of management provided.

METHODOLOGY

This study was conducted as a retrospective, hospital-based observational analysis in the Department of Ophthalmology at the Government Regional Eye Hospital, Visakhapatnam. patients with Medical record, who presented with ocular trauma during a six-month period, from January 2025 to June 2025, were reviewed. The study population comprised all patients of any age and gender who were diagnosed with ocular trauma and either admitted or treated during the specified study period. All eligible cases fulfilling the inclusion criteria were considered for analysis, and a convenience sample of 60 patients was included. Patients with documented ocular trauma and complete medical records were included, whereas cases with incomplete or missing records , those with pre-existing ocular pathologies unrelated to trauma, and referred cases lacking adequate primary clinical data were excluded.

Data were collected retrospectively from hospital records using a standardized data extraction proforma. The information obtained included demographic details such as age, gender, occupation, and place of residence; details regarding the etiology of trauma, including road traffic accidents, domestic injuries, industrial accidents, assaults, and other causes; and the type of ocular trauma was categorized as blunt, penetrating, perforating, chemical, or thermal. Clinical variables such as the anatomical structures involved (including lids, conjunctiva, cornea, sclera, anterior chamber, lens, retina, and optic nerve), the laterality of involvement, time interval between injury and hospital presentation, initial and final visual acuity, treatment modalities (medical and/or surgical), as well as complications and follow-up outcomes were also recorded.

Prior approval was obtained from the Institutional Scientific Committee and the Institutional Ethics Committee before the commencement of the study. Confidentiality of patient information was strictly maintained, and all data were anonymized prior to analysis. The study was conducted in accordance with the ethical principles as per Declaration of Helsinki. Data were entered into Microsoft Excel and subsequently analysed using SPSS. Descriptive statistics, including frequencies and percentages, were used to summarize the data. Inferential statistical tests such as the MC Neymar test were applied and a p-value of less than 0.05 was considered statistically significant.

RESULTS

Among the study participants, 45 (75%) were male, and 15 (25%) were female. The majority of patients were in the 20–40-year age group (43.3%), followed by those aged 40–60 years (30%). (Fig. 1)

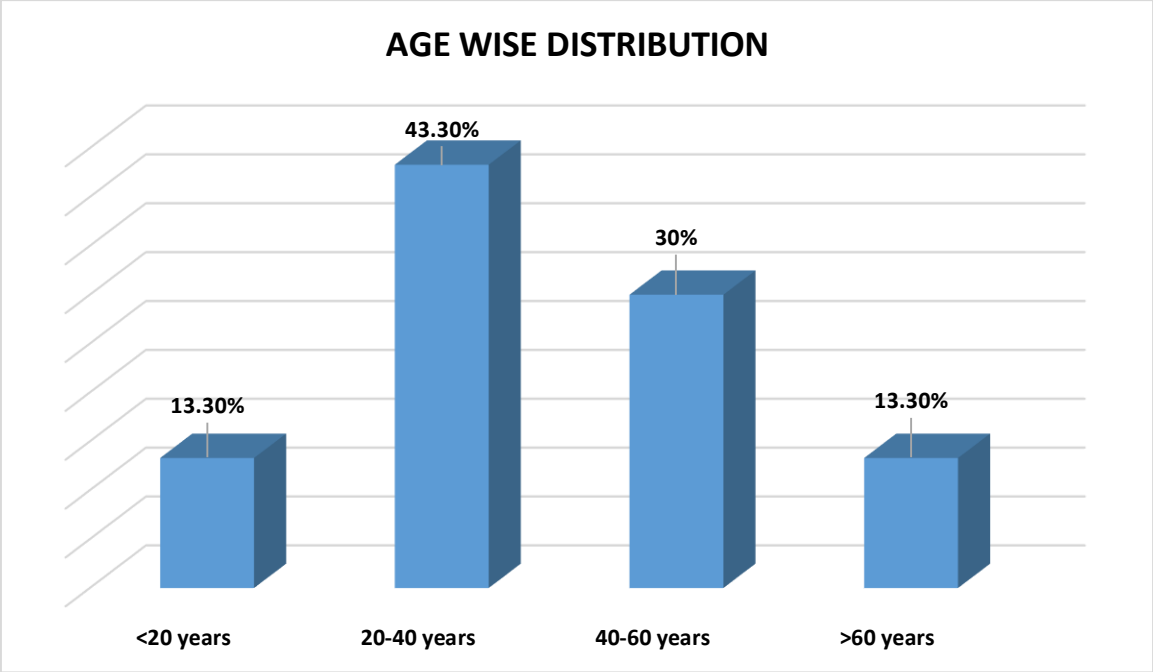


Fig 1: Age-wise distribution of ocular trauma cases

A majority of the patients belonged to urban areas (n=38 [63.3%]), while 36.7% (n=22) were from rural regions.
Among those who presented with ocular trauma 68.3% (n=41) presented with closed globe injury and 31.7% (n=19) presented with open globe injury. (Fig 2) Road traffic accidents were the most common cause of ocular trauma (35% [n=21]), followed by foreign body–related injuries (21.7% [n=13]) and assaults (15% [n=9]). Injuries due to vegetative matter and sports or leisure activities accounted for 11.7% (n=7) and 8.3% (n=5) of cases, respectively, while chemical injuries constituted 5% (n=3) of the study population. The remaining being domestic accidental injuries, constituting 3.3% (n=2).
They were further divided according to the B.E.T.T classification. (Fig 2)

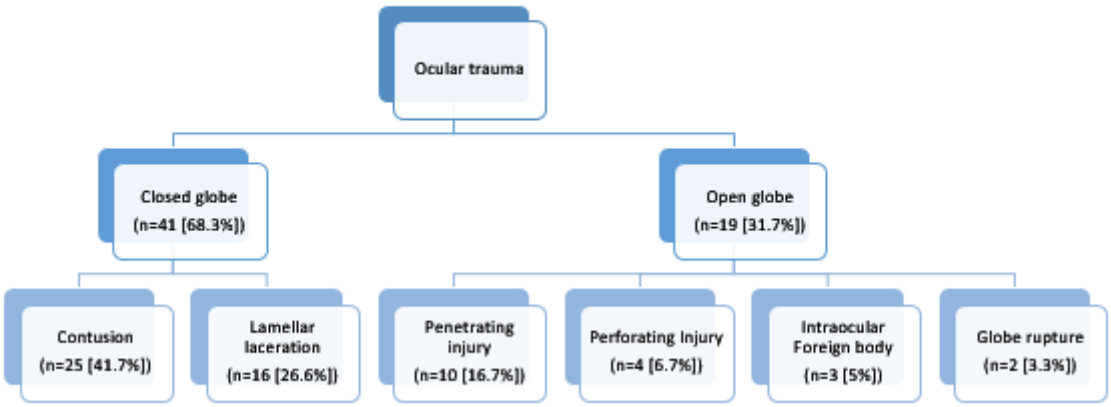


Fig 2: Distribution of Ocular trauma according to B.E.T.T Classification

Among closed globe injuries, contusion was the most common subtype (41.7%), whereas penetrating injury constituted the majority of open globe injuries (16.7%). Right eye was involved in 18 (30%), left in 32 (53.3%) and both in 10 (16.7%). In terms of laterality, the left eye (53.3% [n=32]) was involved nearly twice as often as the right eye (30.0% [n=18]), while 16.7% (n=10) of patients exhibited involvement in both eyes. The mean time interval between injury and hospital presentation was 33.9 hours (approximately 1.4 days).

Table 1: Ocular examination findings (Multiple response answer)

Clinical findings	Frequency (%)
Anterior Segment Findings	
Canalicular laceration	11 (18.3%)
Corneal aberration	14 (23.3%)
Corneal tear	13 (21.7%)
FB over cornea	12 (20%)
Hyphema	21 (35%)
Iris prolapse	11 (18.3%)
Traumatic Iritis	9 (15%)
Lens or Capsular Injury	17 (28.3%)
Posterior Segment Findings	
Vitreous Haemorrhage	8 (13.3%)
Commotio retinae	7 (11.7%)
Retinal detachment	5 (8.3%)
Choroidal rupture	3 (5%)
Macular Injury	4 (6.7%)
Optic nerve Injury	2 (3.3%)

Multiple clinical findings were observed in some patients; therefore, percentages may exceed 100%.
Hyphema (35%) and lens-related injuries (28.3%) were the most frequent anterior segment findings, while vitreous haemorrhage (13.3%) and commotio retinae (11.7%) were the most common posterior segment manifestations. (Table1)

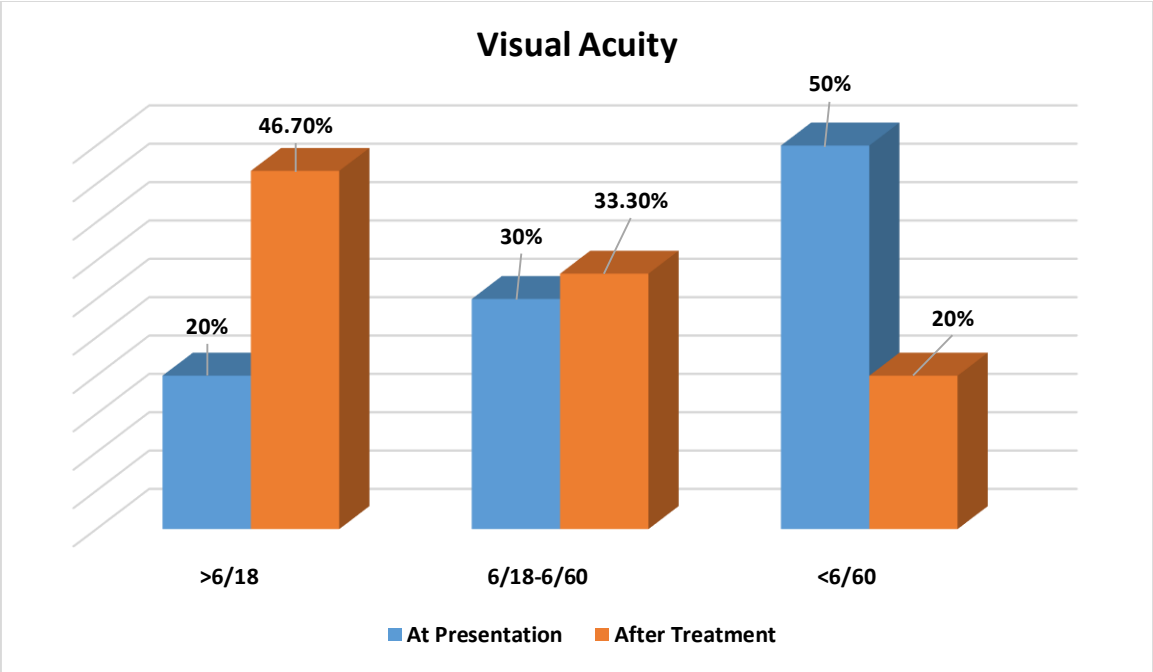


Fig 3: Distribution of visual acuity at presentation and after treatment in patients with ocular trauma

The proportion of patients having good vision (>6/18) increasing from 20% pre-treatment to 46.7% post-treatment, and those with severe visual impairment (<6/60) decreasing from 50% to 20% and this was statistically significant with a p-value of 0.001. (Fig 3)

Among the patients with ocular trauma, 23 (38.3%) needed medical management, whereas 37 (61.7%) of them needed either minor or major surgical interventions.

Table 2: Complications of Ocular Trauma (Multiple Response)

Complications	Frequency (%)
Traumatic cataract	16 (26.7%)
Corneal opacity	14 (23.3%)
Secondary glaucoma	9 (15%)
Persistent hyphema	7 (11.7%)
Vitreous haemorrhage (non-resolving)	6 (10%)
Retinal detachment	5 (8.3%)
Endophthalmitis	2 (3.3%)
Phthisis bulbi	3 (5%)
Optic atrophy	2 (3.3%)

Some patients developed more than one complication; hence percentages may exceed 100%.
Traumatic cataract (26.7%) and corneal scarring (23.3%) were the most common complications observed. Vision-threatening complications such as retinal detachment (8.3%) and endophthalmitis (3.3%) were predominantly seen in open globe injuries. (Table 2)

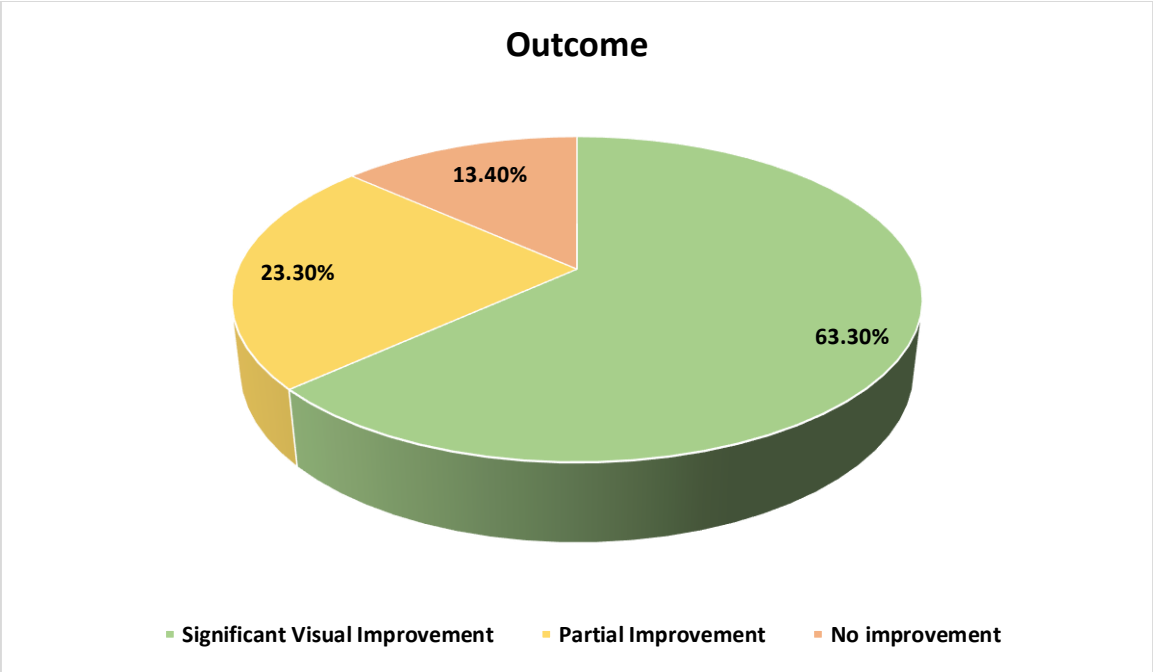


Fig 4: Overall Clinical Outcome at Final Follow-up

At final follow-up, 63.3% of patients showed significant visual improvement, while 23.3% had partial improvement. No improvement or deterioration was observed in 13.4% of cases. (Fig 4)

DISCUSSION

The present study provides detailed insights into the clinical profile of ocular trauma patients at a tertiary care hospital in Visakhapatnam. Our findings align with established patterns in ocular trauma epidemiology while revealing certain region-specific characteristics that warrant attention for targeted preventive strategies.

Our study demonstrated a marked male predominance (75%), consistent with the male-to-female ratios ranging from 2:1 to 4:1 reported across multiple studies. Vishal Wagh et al.,12 Snehal Mahadik et al.,13 Piyushi Sao et al.,14 Jayaram Deepak et al.,15 Wadwekar et al.,16 Yeddula Venkata Rohith Reddy et al.,17 Shraddha Savani et al.,18 Dr Swathi G et al.,19 and Rahul Dagwar et al.,20 reported male involvement of 88.3%, 84.6%, 83%, 80%, 78.8%, 77.1%, 72%, 66.7% and 66% in their studies respectively. This gender disparity reflects increased occupational exposure among males, particularly in high-risk activities such as agriculture, construction, and driving. The traditional gender roles in Indian society, where men predominate in outdoor labour-intensive occupations, contribute significantly to this pattern.

The age distribution in our study showed the highest incidence in the 20-40 year age group (43.3%), consistent with comparable studies. Yeddula Venkata Rohith Reddy et al.17 reported 54.8% in the 21-40 year age range, Wadwekar et al.16 found 46.7% in the same demographic, while Snehal Mahadik et al.13 and Shraddha Savani et al.18 documented similar trends in the 16-46 and 19-30 year groups, respectively. Additionally, Mohanty et al.21 observed 47% of cases in the 21-30 year bracket, and Deepak et al.,15 identified 60% of injuries in the 20-40 year population. This concentration in the economically productive age group carries substantial socioeconomic implications, as these injuries affect individuals during their peak working years, impacting household income and productivity.

The urban predominance observed in our study (63.3%) diverges from findings in several rural-based investigations, though it corresponds with our hospital's predominantly urban catchment area. This finding is corroborated by Jayaram Deepak et al.,15 who reported 64% urban representation. Conversely, studies conducted in other regions demonstrate higher rural involvement, including Vishal Wagh et al.12 (70%), Snehal Mahadik et al.13 (59.6%), Shraddha Savani et al.18 (60%), and Dr. Swathi G et al.19 (56.6%). These discrepancies likely reflect geographical variations in hospital location and healthcare accessibility rather than genuine epidemiological distinctions.

In our study, road traffic accidents (RTAs) emerged as the primary etiology of ocular trauma (35%), followed by foreign body injuries (21.7%) and assaults (15%). These findings align with many literatures identifying RTAs as a major cause of injury, notably Wadwekar et al.16 (64.4%), Vishal Wagh et al.12 (56.6%), Sanjeev Prasad et al22 (42%) and Mohanty L et al.21 (21.3%). However, this distribution contrasts with other studies where RTAs played a secondary role, such as those by Syala et al.23 (23.5%), Jayaram Deepak et al.15 (15%), Gupta et al.24 (13.6%), and Shraddha Savani et al.18 (10%). The variation in

the leading cause of injury across these studies often reflects the demographic and socioeconomic characteristics of the population served. For instance, Gupta et al.24 reported a predominance of agricultural injuries (50%), whereas Jayaram Deepak et al.15 and Syala et al.23 identified workplace-related trauma (45% and 27.5%, respectively) as the most frequent cause. Similarly, Shraddha Savani et al.18 found blunt objects (32.2%) to be the most common mechanism. The high incidence of RTAs in our cohort highlights the urgent need for stricter enforcement of road safety measures, such as the use of helmets and protective eyewear, to mitigate the risk of severe ocular morbidity.

In line with the Birmingham Eye Trauma Terminology (BETT) classification, this study found that closed globe injuries comprised the majority of cases (68.3%), with contusion identified as the most prevalent subtype (41.7%). These findings are consistent with existing literature, reflecting similar trends reported by Sandip Kumar Sahu et al25 (88%), Yeddula Venkata Rohith Reddy et al.17 (82.6%), Sonali Singh et al.26 (81.7%), Vishal Wagh et al.12 (80%), Mohanty et al.21 (68%), Shraddha Savani et al.18 (61.2%), and Syal et al.23 (60.5%).

Conversely, open globe injuries—specifically penetrating trauma (16.7%)—represented a substantial clinical burden often necessitating surgical intervention. This aligns with Piyushi Sao et al.,14 who reported open globe injuries in 38% of their cohort. Furthermore, the predominance of Zone 1 involvement observed in this study consistent with the 58.34% reported by Dr. Swathi G et al.19 underscores the vulnerability of the cornea due to its exposed anterior position.

In our study, hyphema (35%) and lens-related injuries (28.3%) emerged as the primary anterior segment findings. These figures surpass those reported by Gupta et al.24 (hyphema 33.3%, lens 10%) and are significantly higher than the rates documented by Bonu et al.27 (hyphema 15%), Yeddula Venkata Rohith Reddy et al.17 (hyphema 12.8%, lens 8%), and Wadwekar et al.16 (hyphema 1%). The elevated incidence of lenticular pathology in our cohort reflects the heightened severity of trauma cases managed at our tertiary care facility.

Corneal involvement was also substantial, with corneal aberrations (23.3%) and corneal tears (21.7%) being frequently observed. These findings are consistent with Venkata Rohith Reddy et al.17 (18.3% corneal aberrations) and mirror the trends identified by Deepak et al.,15, who noted corneal pathology in 66% of their cases.

Regarding the posterior segment, vitreous hemorrhage (13.3%) and commotio retinae (11.7%) were the most prevalent manifestations. Although retinal detachment occurred less frequently (8.3%), its presence carries a guarded visual prognosis. These results parallel the observations of Gupta et al.,24 who reported vitreous hemorrhage and Berlin's edema in 4.55% of cases. Consistent with broader literature, the relatively lower frequency of posterior segment involvement—compared to anterior segment pathology—nonetheless represents a critical subset of injuries that typically portend poorer visual outcomes.

A significant improvement in visual outcomes were observed in this study, with the proportion of patients achieving good vision (>6/18) increasing from 20% at presentation to 46.7% post-treatment (p=0.001). This statistically significant recovery underscores the efficacy of timely clinical intervention and mirrors the findings of Yeddula Venkata Rohith Reddy et al.,17 who reported a similar post-treatment increase from 11.1% to 46.2%. Our results are further supported by Gupta et al.,24 who noted a rise in visual acuity (>6/60) from 28.7% to 71.2% over two months, and Rahul Dagwar et al.,20 where the majority of patients eventually achieved 6/6 vision. Although Shraddha Savani et al.18 reported a higher baseline acuity (39.8% >6/18), the overall trend across these studies confirms that prompt and structured management is a decisive factor in mitigating visual morbidity following ocular trauma.

In the current study, surgical intervention was required for 61.7% of patients, while 38.3% were managed medically. This surgical predominance aligns with findings by Syala et al.23 (58%) and Sao et al.,14 (58%), though it stands in contrast to the higher medical management rates reported by Arpita Gupta et al.24 (62.12%) and Wadwekar et al.16 (75.4%). More specialized cohorts, such as those of Snehal Mahadik et al.13 (80.7%) and Jayaram Deepak et al.15 (90%), demonstrated even greater surgical requirements. The substantial proportion of surgical cases in this study indicates a high prevalence of severe ocular trauma, emphasizing the critical need for immediate access to specialized ophthalmic facilities. Furthermore, the diverse range of interventions required—extending from primary corneal repair to complex vitreoretinal surgery—underscores the necessity for comprehensive surgical infrastructure and subspecialty expertise at tertiary referral centers.

Preventive Implications

Several critical insights for prevention emerge from this study. First, the high incidence of RTA-related injuries calls for stricter enforcement of helmet laws and use of protective eyewear among two-wheeler riders. Second, workplace safety measures, particularly in agricultural and industrial settings, require strengthening through both regulatory mechanisms and worker education. Third, the delay in presentation despite urban location suggests that public awareness campaigns about ocular emergency management are needed even in cities.

The finding that no patient in several comparable studies had used eye protection at the time of injury represents a critical gap. Targeted interventions should include mandatory protective eyewear in high-risk occupations, subsidized availability of safety goggles, and integration of eye safety education into school curricula and workplace training programs.

Study Limitations and Strengths

This study's prospective design and systematic follow-up represent significant strengths, allowing for comprehensive documentation of visual outcomes. The six-month study period provides adequate representation of seasonal variations in injury patterns. However, the single-center nature and relatively small sample size (n=60) limit generalizability.

CONCLUSION

Ocular trauma is a major cause of preventable visual morbidity in our region, predominantly affecting young, economically productive males. The preponderance of RTA-related injuries in urban settings and the high surgical intervention rate underscore the need for comprehensive trauma management capabilities at tertiary centers. The significant visual improvement achieved through timely intervention validates current management protocols while highlighting the critical importance of early presentation.

Future directions should focus on implementing community-based awareness programs, strengthening referral networks for prompt trauma management, and establishing mandatory protective eyewear regulations in high-risk occupations and activities. Longitudinal studies with larger cohorts would provide more robust data for evidence-based policy formulation and resource allocation in ocular trauma prevention and management.

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Source of Funding: None.

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