ORIGINAL ARTICLE

Prevalence of Ocular Morbidity Among Road Traffic Accident Patients and its Management at a Tertiary Care Centre

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ABSTRACT

Introduction: Road traffic accidents are a significant cause of preventable ocular morbidity. They can lead to permanent visual impairment and reduction in quality of life. **Aims:** To determine the prevalence, clinical spectrum, and management of ocular injuries among RTA patients presenting to a tertiary care center in Nepal. **Methods:** A hospital-based observational cross-sectional study was conducted at Birat Medical College Teaching Hospital. A total of 278 patients presenting with road traffic accidents were enrolled through consecutive sampling. Comprehensive ophthalmic examination was performed for all patients, and ocular injuries were classified based on standard trauma classifications. Statistical analysis was performed to see the associations between variables. **Results:** Ocular involvement was detected in 19.1%. Male predominance (65.5%) was recorded. Two-wheeler riders constituted 66.5% of road traffic accidents victims and 77.36% of those with ocular injuries. Those with ocular injuries 66.03% were not using helmets, and alcohol intake was reported in 53.8%. Periocular injuries were the most common (65%). A significant association was observed between nature of travel and ocular injury ($p = 0.0002$), and between mode of accident and ocular involvement ($p = 0.0000$). At presentation, 71.7% of patients had normal visual acuity, and most were managed conservatively. **Conclusion:** Ocular injuries represent a significant yet preventable consequence of road traffic accidents. Strengthening road safety regulations, promoting helmet use, and ensuring early ophthalmic evaluation are essential to reduce RTA-related ocular morbidity.

Keywords: Ocular trauma, Periocular injury, Road traffic accident

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INTRODUCTION

Road traffic accidents (RTAs) remain one of the leading causes of preventable injury worldwide and place a substantial burden on healthcare systems. While life-threatening injuries often receive immediate attention, ocular trauma is frequently underestimated. It has potential to cause profound visual disability.[1] Given the anatomical proximity of the eyes to the craniofacial skeleton, ocular structures are vulnerable during high-impact trauma.[2] Injuries may occur as part of polytrauma or as isolated events.[3] The severity of ocular damage depends on the magnitude and direction of force, the nature of the impacting object, and the presence or absence of protective measures. Clinical presentations range from simple eyelid abrasions to devastating injuries such as globe rupture or optic nerve trauma, which may result in irreversible vision loss and long-term visual impairment.[4] We can usually find multiple orbital bone fractures that lead to complicated management protocols requiring multidisciplinary approach.[4] Several contributing factors influence the pattern of ocular involvement in RTAs, including the mode of transportation, helmet or seatbelt use, alcohol intake, and delay in seeking medical care.[5] Studies have shown that 10–15% of all ocular injuries requiring hospitalization are attributed to road traffic accidents, with the majority involving young male adults who are economically productive members of society.[6,7] Although studies from Nepal and neighboring regions have described general ocular trauma patterns, focused data on RTA-related ocular injuries and their management are limited. This study was therefore designed to assess the prevalence, spectrum, clinical characteristics, and management strategies of ocular injuries.

METHODS

This observational cross-sectional study was conducted at Birat Medical College Teaching Hospital, Budhiganga, Nepal, involving patients presenting to the Emergency and Ophthalmology Departments following RTAs. All eligible patients attending during the study period were screened for inclusion. The study duration was from the date of acceptance of IRC(Ref- IRC-41-2081/2082) till data collection of sample size was achieved, which was from June 2025 to October 2025. Patients of all age groups and both genders who sustained injuries due to RTAs were included. Sample size was determined using standard prevalence-based calculation, assuming a prevalence of 23.63%,[8] resulting in a minimum sample size of 278. Consecutive sampling was used, and patients were enrolled until the required number was reached. Individuals were included if they presented directly to the hospital following an RTA and received ophthalmological assessment and initial management. Exclusion criteria included non-RTA-related ocular injuries, prior treatment received elsewhere before presentation, or refusal to participate.

Data collection was carried out using a predefined structured proforma covering socio-demographic factors, mechanism of injury, type of impact, type of vehicle involved, use of protective gear, alcohol intake, systemic injuries, ophthalmic findings, and treatment details. Ophthalmic examination included assessment of visual acuity, slit-lamp evaluation, intraocular pressure measurement (when appropriate), and fundoscopy with pupillary dilation. Imaging modalities such as X-ray or CT scan were used when clinically indicated. Ocular injuries were categorized according to standard trauma classification systems. Visual acuity was graded following WHO criteria, and injuries requiring operative intervention or associated with significant structural damage were considered severe.

Statistical analysis

Data analysis was performed using statistical software. Chi-square tests were used to determine associations between categorical variables, and a p-value of less than 0.05 was considered statistically significant. Ethical clearance was obtained from the Institutional Review Committee of Birat Medical College Teaching Hospital.

RESULTS

Among the 278 RTA patients included in the study, the majority (85.6%) belonged to the 15–59-year age group. Male patients predominated consistent with high-risk working-age population, accounting for 65.5% of cases, with a male-to-female ratio of 1.9:1. Only a small proportion of pediatric age group were involved in RTAs. (figure.1)

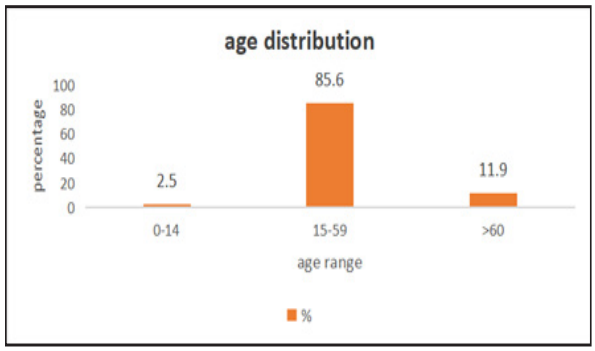

Figure 1: Age distribution among study populations

Two-wheeler users represented the largest group of accident victims (66.5%) followed by 4-wheelers (15.5%) and pedestrians (10.8%). (figure 2). Among those with ocular injuries, 77.36% were two-wheeler riders. Lack of helmet or protective equipment was noted in 66.03% of patients with ocular trauma. Alcohol consumption at the time of accident was documented in 53.8% of cases.

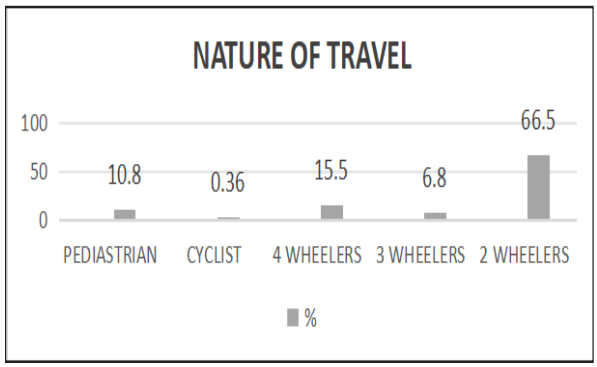

Figure 2: Nature of travel among RTA patients

Collision was the most frequent mechanism of injury (56.8%), followed by sideways (23.7%) and frontal impacts (11.9%). Figure 3

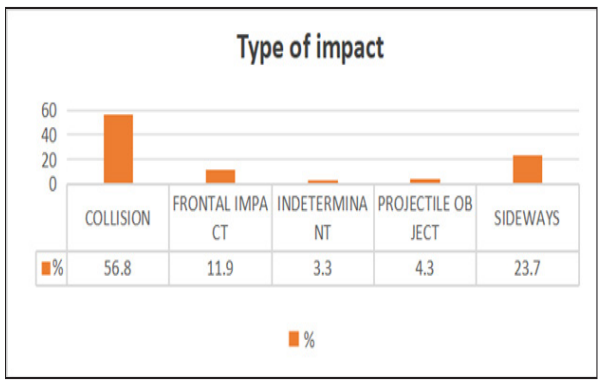

Figure 3 : Showing type of impact among RTA patients

Ocular involvement was detected in 19.1%(n= 53) of all RTA patients. Among them 51% had left eye involved followed by righteye an both eyes (40% and 9%). Periocular injuries were most common (65%), followed by combined globe and periocular injuries (28%) and isolated globe injuries (8%)

(figure 4). Closed globe injuries accounted for the majority, with contusions being the most frequent subtype seen in 17 patients(89.47%) and 2 patients had lamellar laceration (10.52%). Only one case of open globe injury was identified. Among periocular injuries 43 of them had only eyelid injuries and 6 of them had orbit involved along with eyelid in a form of orbital fractures of varying severity.

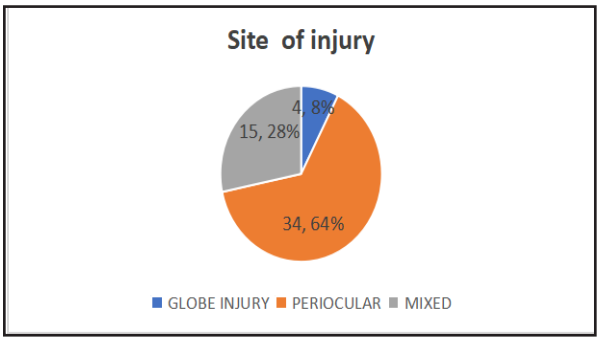

Figure 4: Site of ocular injuries

A statistically significant relationship was found between type of vehicle used and ocular injury (p = 0.0002), as well as between mechanism of accident and ocular involvement (p = 0.0000), particularly in sideways and frontal impacts. Sideways and frontal collisions show notably higher injury rates compared to projectile or in-determinant modes. At presentation, most patients (71.7%) had normal visual acuity. Out of total cases of ocular injuries 2 had severe visual impairment due to severe echymosis with orbital fracture. Three of those who were categorized as blind had closed globe injury leading to rupture, total hyphema and open globe injury. The distribution of visual impairment is shown below:

Visual acuity	Number	Percentage %
Normal	38	71.7
Visual impairment	10	18.9
Severe visual impairment	2	3.8
Blind	3	5.6

Table I: showing distribution of vision according to WHO criteria

Management was primarily conservative or minimally invasive. Medical treatment accounted for 45.3% of cases and surgical management was done in 54.7% of cases. Among surgical management eyelid repair was most common accounting for 45.3% Other interventions included scleral repair, hyphema wash, orbital fracture repair, conjunctival repair, and foreign body removal.

Type of management	Number	Percentage
Medical	24	45.3
Surgical	29	54.7
Total	53	100

Table II: Modalities of management

Types of surgical management	Number	Percentage %
Lid repair	24	45.3
Scleral repair	1	1.9
Lid+ conjunctival repair	1	1.9
Hyphema wash	1	1.9
Orbital # repair	1	1.9
Foreign body repair	1	1.9

Table III: Surgical Management

DISCUSSION

The present study demonstrates that ocular injuries are a notable consequence of RTAs, affecting nearly one-fifth of cases. There were 278 cases of RTAs, a substantial proportion (85.6%) fell within the 15-59 year age range. Young males constituted the most affected population, reflecting their higher exposure to traffic and greater involvement in high-risk driving behaviors. This finding is similar to study conducted by Das S et al at Guhawati Medical college which has reported that 75.2% of ocular injuries from RTA occurred in males, with most patients being in their third and fourth decades of life.[9] Our study had male predominance (male : female = 1.9:1), consistent with studies that report 80 -88.40% of men as more frequent victims of road traffic-related ocular injuries.[8,10] Two-wheeler riders constituted the majority (66.5%) of RTA victims and 77.35% in those who had ocular injuries due to RTAs and poor helmet compliance (66.03%) emerged as a key modifiable risk factor. This is particularly concerning, as the lack of protective gear is a well-established risk factor for facial and ocular trauma. Previous studies similarly report high prevalence of ocular injuries among two-wheeler riders and low usage of helmets - for instance, in a large trauma-database study, lack of protective gear was significantly associated with increased risk of orbital fractures (OR = 2.4; p < 0.0001).[11] A study done in north India shows only 30.53% of 2 wheeler riders sustained eye injuries which is much lesser than our study.[8] where as studies by other authors in India have 87.33% and 73.6% of ocular injuries occurred in two-wheeler riders.[12,13] Not using helmets have greater impact in RTAs and ocular morbidity. Findings of our study (66.03%) regarding this has a similar finding with the study done in Northern India.[8] Thus travelling without wearing protective gears is one of the major modifiable risk factors for RTA related ocular injuries. Alcohol consumption also played a substantial role in accident occurrence and severity(53.8%). Similar results(42.10 %) were seen in other study.[8] Driving under the influence of alcohol is a risk factor for ocular morbidity in RTAs.[5] These findings highlight the urgent need for stronger enforcement of safety regulations and public awareness initiatives.

Regarding the type of impact, collision was the most common mode (56.8%), followed by sideways impact (23.7%) and frontal impact (11.9%). Similarly in another study, frontal collision (37.89%) was the commonest followed by sideways impact (26.32%).[8] There is a significant association between the mode of accident and ocular injury(p = 0.0000),especially with

sideways and frontal collisions. This suggests that certain types of impacts may confer higher risk to ocular structures, maybe due to greater force transmission to the face. This emphasizes the importance of preventive road safety measures. Ocular involvement was present in 19.1% of RTA victims in our study. Approximately 1 in 5 RTA patients presented with ocular morbidity. By putting 95%CI prevalence is 14.4%-23.8%.

Similar prevalence was seen in the study which was done in a tertiary center of northern India.[8] This study shows morbidity was slightly more predominant in the left eye (43.4%). Some of the other studies had right eye involvement (52%, 53.8%).[14,15] Most ocular injuries involved periocular tissues (65%), with closed globe injuries being more prevalent than open globe injury. This pattern aligns with observations from similar regional studies where periorbital edema and eyelid lacerations dominated the spectrum of ocular trauma.[14,16] Within closed globe injuries, contusion was predominant and open globe injuries were rare (only 1 patient had zone 2 open globe injury-scleral perforation). This is similar to findings in several studies where closed globe injuries significantly outnumber open globe trauma in RTA-related eye injuries.[12,17,18] As there were less number of vision threatening injuries 71.7 % of patient's presenting visual acuity was normal(WHO criteria).

The predominance of normal visual acuity at presentation suggests that many injuries were superficial; however, the potential for delayed complications must not be overlooked. In terms of management, nearly half of the patients (45.3%) were treated medically, and an equal proportion underwent lid repair. Surgical interventions such as scleral repair, hyphema wash, orbital fracture repair, or foreign body removal were rare. This again underscores that many RTA-related ocular injuries are superficial or non-penetrating, amenable to conservative or minor surgical management.

LIMITATIONS

This study was limited by its hospital-based design, which may not reflect the true community burden. Self-reported data on helmet use and alcohol intake may be subject to bias. Lack of long-term follow-up prevented assessment of final visual outcomes. Additionally, detailed evaluation of posterior segment involvement was limited, potentially underestimating severe ocular sequelae.

CONCLUSION

Ocular trauma represents a significant yet largely preventable morbidity among RTA victims, particularly among two-wheeler riders. Low usage of protective gear and high prevalence of alcohol involvement underline critical areas for intervention. Despite the fact that most injuries were closed-globe or periocular (with generally good visual prognosis), effective prevention strategies could further reduce the burden. Strengthening emergency eye trauma services and enforcing road safety measures are both essential steps toward mitigating this public health challenge.

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