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PROFILE OF OCULAR AND PERIOCULAR TRAUMA AND OUTCOME OF ITS PRIMARY MANAGEMENT

Opthalmology

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ABSTRACT

The study was done in 100 patients to evaluate the profile of ocular and periocular trauma and assess the outcome of its primary management. A prospective hospital-based observational study was conducted at the tertiary care centre from January 2023 to January 2024. Comprehensive ophthalmological examination was done. Ocular injuries were classified according to Birmingham classification, and the Ocular Trauma Score (OTS) was calculated. Maximum (28%) patients were in the age group of 21-30 years while individuals more than 60 years of age constituted the smallest group (1%). The gender distribution was 70% male and 30% female. Most of the patients were factory workers (46%), followed by students (32%). 93% injuries were mechanical and 7% non-mechanical. 10% of the injuries were periocular and 90% were ocular. The main causes of injury were sharp objects (36%) and road traffic accidents (22%). Majority of patients had OTS score of 5 indicating favourable prognosis. A statistically significant (p value = 0.0001) improvement was seen in vision at three-month follow-up. Prompt and appropriate management significantly improves visual acuity.

KEYWORDS

Ocular trauma, eye injuries, Periocular trauma, Open globe injuries, Closed globe injuries

INTRODUCTION

Ocular trauma is a significant cause of preventable visual impairment and unilateral visual loss worldwide. It is the third most common organs affected by trauma after hands and feet. [1] It is a significant public health concern, particularly in developing countries, where the incidence of ocular trauma is higher due to various factors such as inadequate safety measures, lack of awareness, and limited access to proper healthcare facilities. This may range from a small foreign body on the cornea to a ruptured globe.

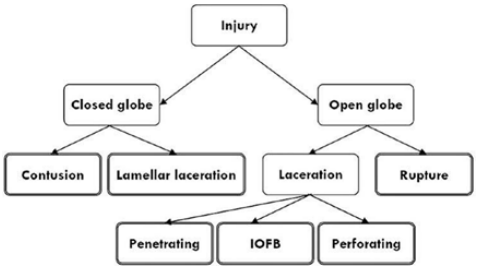
In addition to physical and psychological cost of eye injuries to the individual, there is a direct and indirect financial cost to the society and environment because even minor eye injuries can cause considerable morbidity and time loss from work, as those affected often have to face loss of career opportunities, major lifestyle changes and occasionally permanent physical disfigurement. [2,3,4]

It is believed that majority of eye injuries are preventable with existing, relatively inexpensive protective devices and health education. However the lack of health infrastructure, poor health seeking behaviour of patients and low level of patient care all compound to create a worse prognosis for those with ocular trauma in developing countries. [5] With regard to the public health problem presented by ocular trauma, it becomes necessary to gather information regarding the mode of presentation, nature of injuring agent, to observe and detect the extent of involvement of different structures and complications. This would enable us making specific strategies for prevention of ocular and trauma. The aim of this study is to evaluate the profile of ocular and periocular trauma and assess the outcome of its primary management.

MATERIAL AND METHODS

A prospective hospital-based observational study was conducted at the tertiary care centre for a period of 1 year after taking approval from ethical committee of our institute. Informed consent was obtained from all individual participants included in the study in their vernacular language. Patients of all age groups with a recent history of ocular and periocular trauma were included, with a follow-up of at least three months. Patients with prior ocular trauma or surgery, pre-existing corneal pathology and who were loss to follow-up were excluded from the study. Detailed history and ophthalmological examination, including visual acuity, intraocular pressure (IOP) (if and when possible), external ophthalmological examination and slit lamp examination were performed. Fundus examination (if and when possible) was done by using direct ophthalmoscope and indirect ophthalmoscope. Imaging such as X-rays, B-scans, CT scans, and MRIs were performed as per requirement. Ocular injuries were classified according to the Birmingham classification (BETTS). [6]

Flowchart showing BETTS classification of ocular injuries (Abbreviation: IOFB- Intraocular Foreign Body)



Open globe injuries were divided in zones based on the site of injury as:

1) Zone I (Z1); limited to cornea (including the corneoscleral limbus)
2) Zone II (Z2); Corneoscleral limbus to a point 5mm posterior into the sclera
3) Zone III (Z3); Posterior to the anterior 5mm of sclera [6]

Ocular trauma severity (OTS) scoring [7] was done at the time of presentation as per the following table to find the severity of ocular trauma.

Steps	Visual acuity (VA)	Raw points
Step I: Raw points based on VA	No light perception(LP)	60
	Light perception to hand movement	70
	1/200 to 19/200	80
	20/200 to 20/50	90

Step2: Raw points based on associated ocular injuries	Globe rupture	-23
	Endophthalmitis	-17
	Perforating injury	-14
	Retinal detachment (RD)	-11
	Afferent pupillary defect (APD)	-10
Total score obtained on adding the raw points in step 1 & 2	0-44	1
	45-65	2
	66-80	3
	81-91	4
	92-100	5

Management was done according to the type of injury. Follow up was done on day 1, day 7, and 3 months. Best corrected visual acuity, intraocular pressure (IOP) (if and when possible), external ophthalmological examination, slit lamp examination, fundus examination (when required) was done on follow up and documented. Data analysis was done using licensed SPSS software version 21.0 (Chicago, Illinois). Univariate analyses was done initially and the results were presented with the help of tables, text, bar-diagrams and pie-charts. Descriptive statistics were used to calculate frequencies of categorical variables, and measures of central tendencies and dispersion were used to describe continuous variables. Chi-square test was used for categorical variable. A p-value <0.05 was considered as statistically significant.

RESULTS

Patient Demographics: The study included 100 patients with ocular and periocular trauma. The age distribution showed that 28% patients were in the age group of 21-30 years, followed by 24% of the cases in 11-20 years then 19% each cases were seen in 31-40 years and 41-60 years age group. Children aged 1-10 years comprised 9% of the cases, while individuals more than 60 years of age constituted only 1% of the total cases. The Gender distribution indicated that 70% were males and 30% females. Distribution according to occupation of the patients showed that the majority of the affected individuals were factory workers (46%), followed by school-going students (32%), with the remainder being household workers (10%), farmers (7%), and others (4%). The zones of open globe injuries were distributed as follows: Zone 1 (13%), Zone 2 (7%), and Zone 3 (4%). The study also found that the majority of patients (57%) had an OTS score of 5. Distribution according to nature and cause of injury is shown in table 1.

Table 1: Distribution according to nature and cause of injury maximum being sharp objects 36%.

Nature	Cause	No. of cases	Percent
Mechanical Injuries	RSA	22	22.0
	Firecracker	6	6.0
	Sports related	6	6.0
	Sharp objects (iron dust, scissor, tile, shattered glass, splinter)	36	36.0
	Wooden stick	6	6.0
	Assault	10	10.0
	Miscellaneous (keys, pencil, nail)	7	7.0
Non Mechanical Injuries	Burns – Chemical Thermal	4 3	7.0

Abbreviation: RSA-Road side accidents

Distribution according to periocular and ocular injuries is shown in table 2, with maximum being closed globe ocular injuries.

Table 2: Distribution according to periocular and ocular injuries.

INJURIES	NO. OF CASES	PERCENT
PERIOCULAR A) Lid laceration B) Lid laceration with orbital fracture C) Contusion	10 8 2 10	10.0
OCULAR A) Open globe B) Closed globe	90 24 66	90.0
MIXED	21	21.0

Multiple injuries were sustained in many patients. Distribution of different type of ocular injuries is described in Figure 1.

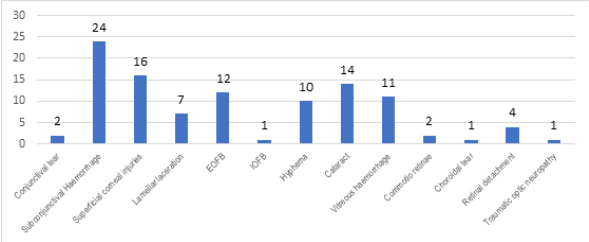


Figure 1: Showing distribution of different type of ocular injuries.

Abbreviations: IOFB- Intraocular Foreign Body, EOFB- Extraocular Foreign Body

In our study we have classified ocular injuries according to the BETTS classification with maximum being contusion injuries (includes subconjunctival haemorrhage, cataract, vitreous haemorrhage, retinal detachment and choroidal tear) in 74% of patients where multiple injuries were sustained in many patients., its distribution is shown in table 3.

Table 3: Showing distribution according to BETTS classification

OCULAR TRAUMA			
OPEN GLOBE INJURIES		CLOSED GLOBE INJURIES	
Rupture	2 (2.0%)	Contusion	74 (74.0%)
Penetrating	21 (21.0%)	Lamellar laceration	7 (7.0%)
IOFB	1 (1.0%)	Superficial corneal foreign body	12 (12.0%)
Perforating	0 (0.0%)		

Abbreviation: IOFB- Intraocular Foreign Body

75% of the patients required surgical management and its distribution is shown in figure 2.

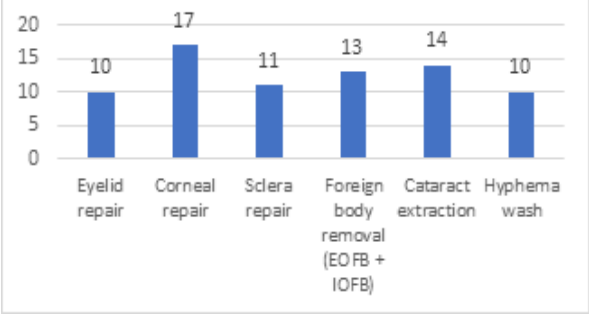


Figure 2: Distribution according to surgical management of the patients.

Abbreviations: EOFB- Extraocular Foreign Body, IOFB- Intraocular Foreign Body

Visual outcome from presentation up to 3 month follow-up was documented for all our patients and a statistically significant improvement (p value= 0.0001) in best corrected visual acuity (BCVA) was found at 3 months as shown in table 4.

Table 4: Showing overall best-corrected visual acuity (BCVA) from presentation up to 3 month.

	At presentation		At 3 months	
Visual acuity (LogMar)	No. of cases	Percent	No. of cases	Percent
20/20 (0.0)	33	33.0	53	53.0
20/30 (0.18)	7	7.0	21	21.0
20/40 (0.30)	17	17.0	11	11.0
20/60 (0.48)	4	4.0	0	0.00
20/80 (0.60)	9	9.0	4	4.0
20/120 (0.78)	12	12.0	6	6.0
20/200 (1.00)	3	3.0	0	0.00
PL + PR+	15	15.0	4	4.0
Total	100	100.0	100	100.0
p-value	0.0001			

Atlas

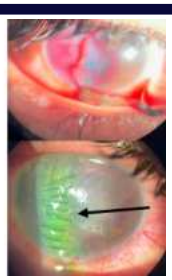


Photo 1 : Showing Globe Rupture (gr)
Photo 2: Showing Zone 2 Open Globe Injury With Iris Prolapse At Presentation And After Surgical Repair

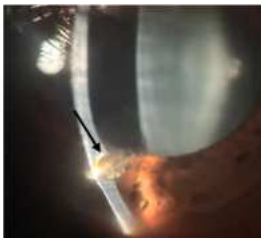


Photo 3: Showing Iofb
Photo 4: Showing Lamellar Laceration With Eofb

Photo 5: Showing Eyelid Laceration At Presentation And After Follow Up At Day 3 And After 1 Month

DISCUSSION

Ocular and periocular trauma is a significant global public health issue that results in considerable morbidity, visual impairment, and a notable socioeconomic burden. Understanding the epidemiological profile, clinical characteristics, and outcomes of ocular trauma is essential for devising effective preventive strategies and improving patient management. This study aimed to evaluate the profile of ocular and periocular trauma to assess the outcomes of its primary management.

The demographic distribution of ocular and periocular trauma cases revealed that the highest incidence of trauma was seen in the age group of 21-30 years (28%), while individuals more than 60 years constituted the smallest group, with only 1% of the total cases. This trend suggests that younger individuals are maximally affected by ocular trauma. This may be attributed to increased exposure to risk factors such as work-related hazards, outdoor activities, and risk-taking behaviours. Similar findings were observed in studies by Singh et al. (2005) and Maurya et al. (2015), which reported a high prevalence of ocular trauma among young students. Karve et al. (2017) also noted that 36.25% of ocular trauma patients were in the 16-30 years age group, and 29% were in the 31-45 years age group. [8,9,10]

The gender distribution of ocular trauma cases in this study showed that 70% of the patients were males, while 30% were females. The male predominance is consistent with findings of studies done by Dhasmana et al. (2012) and Bilal et al. (2021) [11, 12]. This gender disparity may be due to various factors, including increased occupational and recreational exposure to risk factors, higher risk-taking behaviours, and sociocultural influences that predispose males to a higher incidence of ocular injuries.

In terms of occupational distribution, the current study found that the majority of patients were (46%) among factory workers. This was followed by school-going students (32%), household-related work (10%), farmers (7%), and miscellaneous occupations (desk work, journalists etc.) (4%). The results were consistent with the study conducted by Bilal et al. (2021) who categorized ocular trauma as professional (61%) and non-professional (38%), with professional trauma being more common.[12] Singh et al. (2005) similarly reported that ocular trauma commonly affected young students, labourers, and factory workers.[8] The high prevalence of ocular injuries among factory workers, students and labourers underscores the need for targeted preventive strategies in these scenarios.

The causes of ocular and periocular trauma in the current study were diverse, with the most common being sharp objects (36%), followed by road traffic accidents (22%), assault (10%), firecrackers (6%), sports-related injuries (6%), and vegetative or wooden stick injuries (6%). Dhasmana et al. (2012) however reported that road traffic accidents were the leading cause of ocular injuries, accounting for 37.86% of cases.[11] The diversity of causal factors highlights the multifaceted nature of ocular trauma and the need for targeted interventions in these specific domains. In our study, firecracker injuries were less frequent, as these incidents typically occurred during specific occasions when firecrackers are used.

The study also examined the nature of ocular and periocular injuries, and found that 93% were mechanical in nature, while 7% were non-mechanical (chemical (4%) and thermal (3%) injuries). Patients with periocular injures were 10% of the total cases, 8% of which had lid laceration, 2% had orbital fracture along-with lid laceration and all of them had contusion, 21% of these injuries were mixed. Of the ocular injuries, 66% were closed globe injuries and 24% were open globe injuries. Study done by Karve et al (2017) reported that mechanical injuries were predominant, accounting for 95.25% of cases, while non-mechanical injuries were less common (4.75%) and closed globe injuries were more frequent (80.04%) than open globe injuries (14.96%) [10]. Dhasmana et al (2012) found that closed globe injuries were more common (53.39%) than open globe injuries (7.76%) [11]. In this study out of closed globe injury patients, maximum cases (24%) were subconjunctival haemorrhage, retinal detachment seen in 4% cases, while the least reported were 1% each of IOFB, choroidal tear and traumatic optic neuropathy (TON). Whereas, Singh et al (2005) observed that the incidence of intraocular foreign body and retinal detachment was 17.4% and 11.3%, respectively.[8]

In our study among open globe injuries Penetrating injuries were the most prevalent, affecting 21.0% of the total cases, Rupture injuries accounted for 2.0% of cases while IOFB injuries were relatively rare, with only 1.0% of the total injuries. Among closed globe injuries, Contusions (including subconjunctival haemorrhage, cataract, vitreous haemorrhage, retinal detachment and choroidal tear) were the most common accounting for 74.0% of the total cases, where multiple injuries were sustained in many patients. Superficial corneal foreign bodies were observed in 12% of cases. Lamellar lacerations accounted for 7.0% of the cases. Whereas study conducted by Sahraravand A et al in 2017 found that out of 831 patients 15 were open globe injuries from which 3 (0.36%) were rupture injuries, 10 (1.20%) were penetrating and 2 (0.24%) had IOFB. 232 were closed globe injuries in which 230 (27.6%) had contusions and 2 (0.24%) had lamellar laceration [13].

Among the open globe injuries, 12% were zone 1(cornea to limbus), 7% were zone 2(from limbus to anterior 5 mm of sclera), and 4% were zone 3(point beyond anterior 5mm of sclera) injuries. Similarly a study by Sao P and Vallabha K found that open-globe injury involved zone 1 in 7% (n=7) of patients and 9% (n=9) for zone 2 , and 6% (n=6) zone 3. [14]

The majority of patients had an Ocular Trauma Score (OTS) of 5 (57%), followed by scores of 4 (27%), 3 (14%), and 2 (2%). Our study is consistent with the study done by Sahu et al (2024) who also found that the majority were in OTS grade IV (67%) [15]. The OTS showed significant correlations with final visual acuity. The current study's findings align with evidence from comparative studies, emphasizing the importance of tailored management strategies to improve prognosis for ocular and periocular trauma patients.

The study also assessed the surgical management and visual outcomes of ocular trauma patients. The surgical management was done in 75 cases out of 100 patients taken in the study, 17% of the patients had undergone corneal repair, 14% had cataract extraction, foreign body removal was done in 13% patients, 10% of the cases had undergone

eyelid repair, hyphema wash was done in another 10% and sclera repair was done in 11% patients. The current study's findings on the surgical management of ocular trauma are consistent with the study by Alem KD et al (2019) in which surgical management post ocular trauma was performed in 53.17% (411) patients; corneal tear repair was the most performed procedure (51.8%), and crystalline lens extraction/ lens fragment washout was done in 21.41% cases. [16] The higher number of patients undergoing surgical procedures, especially corneal repair and cataract extraction, underscores the importance of prompt surgical intervention in enhancing the visual outcomes.

In our study, among all patients with periocular trauma, visual acuity at presentation was not affected and remained unchanged at 3 month follow up. 13 (19.6%) cases of closed globe injury showed improvement in visual acuity and 2 (3.0%) cases showed no improvement. 4 (16.6%) cases of open globe zone 3 injuries did not show any improvement. 20 (83.33%) cases showed improvement out of which 11 (45.8%) had visual acuity in 0.00-0.48 (logMAR) range and 9 (37.5%) were in 0.60-1.00 (logMAR) range but they failed to regain full vision. Puodžiuvienė (2021) et al. found that 19.5% of open globe injury patients regained good final vision (≥0.5), but 48.1% experienced severe visual impairment (BCVA ≤ 0.02). [17] Ling Yeung(2006) et al. reported that 21% had final visual acuity of 20/40 or better, and 54% had less than 20/200. [18]

CONCLUSION

The current study's findings on the management approach and visual outcomes highlight the importance of prompt and appropriate interventions in improving the prognosis for patients with ocular and periocular trauma. The relatively higher incidence of ocular trauma in the younger population highlights the need for targeted preventive measures, educational campaigns, and age-specific interventions to address this significant public health concern. Identifying the high-risk age groups can guide the development of appropriate safety protocols, personal protective equipment, and awareness programs to reduce the burden of ocular injuries.

Limitations of the Study

Limitations of the study: Single-centre design, limiting generalizability.

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