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TO DESCRIBE EPIDEMIOLOGY AND VISUAL OUTCOME OF OCULAR TRAUMA PATIENTS AT TERTIARY HOSPITAL IN AHMEDABAD.

Dr. Anupama Mahant	M.S. OPHTHAL, Associate Professor, Ophthalmology department, AMC MET Medical College, L.G. Hospital campus, Maninagar, Ahmedabad.
Dr Rabab Bhuriwala	Resident Doctor, Ophthalmology department, AMC MET Medical College, L.G. Hospital campus, Maninagar, Ahmedabad.
Dr. Vijay Damor*	M.S. OPHTHAL, Assistant Professor, Ophthalmology Department, AMC MET Medical College, L.G. Hospital campus, Maninagar, Ahmedabad. *Corresponding Author

ABSTRACT **Background:** To describe the epidemiology and visual outcome of patients with Ocular trauma treated at a tertiary hospital in Ahmedabad. Ocular trauma is a common and preventable cause of visual impairment and blindness worldwide. Specific morbidities such as blindness is a serious complication that commonly results from patients with ocular trauma and can significantly impair the patient's social and occupational abilities. This study is conducted due to the current lack of data on ocular injuries in developing countries and aims to investigate and evaluate the impact of ocular trauma. **Material And Methods:** This hospital-based prospective randomized study was undertaken between May 2018 and November 2020. Data on demographic features, site of trauma, causative agent, circumstances of trauma, the time between the occurrence of trauma and presentation to the hospital, and previous ocular or systemic disease were collected. The main outcome variable was best corrected visual acuity at 6 months following the initial visit. **Results:** A total of 112 patients with ocular trauma were recruited with a follow-up of 6 months following recruitment. The most affected age groups were 26-40 years (25.89%), followed by 0-6 years (16.07%), and 7-16 years (16.07%). The male to female ratio for ocular injury was 3.87:1. Most patients had open globe injury (28, 25%), while 20 (16.5%) had closed globe injury, 38 (33.93%) had the adnexal injury, 7 (6.25%) had open plus adnexal, 7 (6.25%) had closed plus adnexal and 12 (10.71%) had a chemical injury. Furthermore, among the adult population, the majority 28 (25%) had an ocular injury at the workplace, while most pediatric injuries 23 (20.54) occurred at home during play. The incidence of monocular blindness 2 (9%) was at a six-month follow-up after the initial presentation. The factor that was associated with monocular blindness was open globe injuries. **Conclusion:** Ocular trauma is a grave cause of ocular morbidity and mortality. Prompt transfer to a good eye facility, early investigations, and management are key features to prevent permanent visual loss. Prophylactic and protective measures are of utmost importance in preventing visually disabling complications of ocular trauma. Resources should be mobilized to provide quality ocular emergency care.

KEYWORDS : Ocular trauma, Open and closed globe injury, Visual disability, Prevention

INTRODUCTION

Ocular trauma is any injury to the eyeball, its adnexa, orbit, and periorbital structures. The adnexa include eyelids, eyebrows, and the lacrimal system. According to the BETT classification, ocular trauma can be classified into either closed globe injuries such as contusions and lamellar lacerations, or open globe injuries such as penetrating lacerations, perforating lacerations, intraocular foreign bodies, ruptured globe or adnexal injuries[1]. Ocular trauma may be accidental or non-accidental. The trauma may be caused by different objects found in both work and home environments and these objects range from blunt to sharp objects, hot objects, chemical substances, electrical power sources, and different types of radiation such as UV & X-ray. A significant shift from workplace to home has been shown in some studies[2]. Ocular trauma is a common preventable cause of visual impairment and blindness worldwide. Using data from the literature review and the WHO blindness data bank Negrel et al. found that there are 55 million eye injuries per annum globally that result in restriction of daily activity, of which 19 million have at least unilateral permanent reduction in vision and 1.6 million are blind from their injuries[3].

Ideally, the prevalence of ocular trauma is determined by population-based studies. In a population-based study in which all ophthalmic departments in Scotland participated the incidence of ocular trauma that required hospital admission was estimated to be 8.14 per 100,000 population[4]. However, most studies describe the proportion of ocular trauma in hospital-based studies and it is variable ranging from 53.3% in Singapore[5], 1.06% in Pakistan, 5.0% in Central Ethiopia, and 4.6% in South-South Nigeria. The prevalence of ocular trauma in rural and urban Indian populations varies from 4.5% to 7.5% and 2.4% to 3.97% respectively.

However, since ocular injuries can cause loss of carrier, major lifestyle changes, and cosmetic disfigurement they have a significant socioeconomic and psychological impact. They are a significant cause of monocular visual impairment. [7,8]

Data on the epidemiology and visual outcome of ocular injuries are limited to low-income countries. The present prospective randomized study aimed to evaluate the characteristics of ocular injuries and the demographic characteristics of patients newly diagnosed with ocular trauma at our hospital.

MATERIAL AND METHODS

This hospital-based prospective randomized study includes all patients admitted to the Ophthalmology Department at Tertiary care hospital, who had ocular trauma in the period between May 2018 and November 2020. Institutional Review Board approval was obtained. The following information was obtained: demographics (age, sex, date, and time of admission) cause and objects of trauma, medical status of the patient, associated body injury, site of involvement, mechanism of injury, and detailed eye parts involvement. In addition, imaging modalities with findings and management intervention were retrieved. All patients with open as well as close ocular injuries (due to RTA, accidental falls, domestic injuries, chemical injuries, or electrical injuries) were included. All patients giving consent were included after completing all the medico-legal formalities. Both males and females of all age groups are included. Patients not giving consent for participating, or suffering from any mental/ neurological/debilitating illness which may hamper examination are not included. Following administration of initial treatment on the day of presentation, all patients were undergone Ophthalmological examination including visual acuity, ocular motility; examination of the anterior segment by slit lamp or surgical microscope; fundus bio-microscopy with volk 90 dioptre lens and dilated fundus examination with indirect ophthalmoscopy when possible, IOP measurement (if possible). Diagnosis according to the Standardized classification of ocular trauma using the Birmingham Eye Trauma Terminology (BETT) classification is recorded with two more categories (orbital and Adnexal trauma) included to increase comprehensiveness. Treatment received, either medical or surgical including surgical steps or number of surgeries is recorded. The patients were examined for follow-up at one day, one week, fifteen days three months, and six months after the injury, with the final visual outcome (BCVA) in the affected eye using the Snellen visual acuity examination. 5 counting fingers in poor visual acuity, any eye with BCVA $\leq$ 6/60 was considered as having poor vision.

The data were subsequently analyzed to determine their impact on the final visual outcome. The chi-square test is used for categorical data. A probability value of <0.05 and <0.01 is considered to be significant and highly significant respectively. The software used is SPSS 20.0.

RESULTS

This study included 112 patients admitted to tertiary care hospital with ocular injuries in the study period.

Demographic Characteristics

Ocular injury was more common in males than in females with a male: female ratio of 3.87:1 (89 males and 23 females). Most affected age groups were 26-40 (n=29, 25.89%), followed by 0-6 (n=18, 16.07%), 7-16 (n=18, 16.07%) Majority of the study population presented within 24 hours of injury (n=98, 87.5%). No patient reported prior use of traditional eye medication.

Table I. Demographic Distribution:

Age (years)	Male	Female	Total	ratio	P value
0 – 6	13	5	18 (16.07%)	2.6:1	
7-16	12	6	18 (16.07%)	2:1	
17-25	16	2	18 (16.07%)	8:1	
26-40	26	3	29 (25.89%)	8.7:1	
41-60	16	6	22 (19.64%)	2.7:1	
>60	6	1	7 (06.25%)	6:1	
Total	89	23	112 (100%)	3.9:1	0.31
Circumstances of trauma					
Child play	18	5	23 (20.54%)		
Workplace	25	3	28 (25.00%)		
Accidental injury	1	0	1 (00.89%)		
Traveling	1	0	1 (00.89%)		
Assault	8	2	10 (08.92%)		
Household injuries	20	9	29 (25.89%)		
Unknown	16	4	20 (17.85%)		
Total	89	23	112 (100%)		0.65
Presentation time (hours)	Number	%			
Early (<24 hours)	98	87.5			
Delayed (>24 hours)	14	12.5			

Etiology Of Ocular Trauma

Most injuries were secondary to blunt trauma (n=63). The commonest causative agent was iron rod 17 (14.28%). The majority (n=29, 25.89%) group in whom ocular trauma occurred mostly at home followed by injuries at the workplace (n=28, 25%). For adults, the commonest place of injury was on the road (n=20, 17.86%).

Table II: Causative Agents Of Ocular Trauma

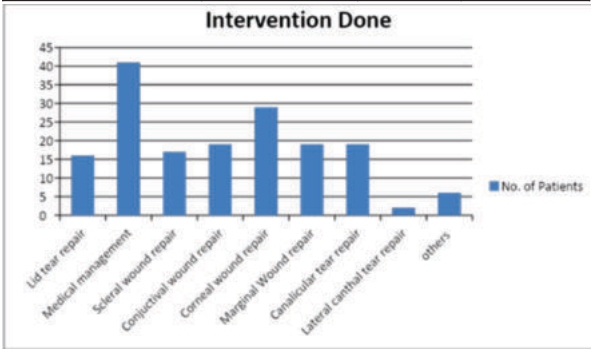
Causative Agent		Number Of Patients	%
Blunt	Cricket Ball	7	6.25
	wooden stick	7	6.25
	Iron rod	17	14.28
	Plastic bottle	2	1.78
	Stone	10	8.93
	Toy	2	1.78
	Hand/fist	5	4.46
Sharp	Glass	3	2.68
	Knife	2	1.78
	Pencil	1	0.89
	Blouse hook	3	2.68
	Machine cutter	5	4.46
	Fingernail	2	1.78
	Kite thread	2	1.78
	Edge of bed/swing/spring	10	8.93
(RTA)		09	8.03
Projectiles	Fireworks	11	9.82
	Chemical fall	12	10.71
Cow's horn		2	1.78
Total		112	100

Treatment Of Ocular Trauma

The majority of the patients sustained open globe injury (n=28, 25%) with penetrating injury. The closed globe injury was (n=20, 17.86%). 71 patients (63.4%) required surgical treatment, 30 (26.78%) patients were treated medically and 11 (9.82%) were treated medically and surgically. 25 (22.32%) patients had repair of corneal/ Scleral wounds. 18 (16.7%) patients had canaliculi intubation and 16 (14.3%) patients had repair of conjunctival wounds. 12 (10.7%) patients had repair of lid wounds.

Table III: Distribution Of Cases According To Type Of Injury

Type Of Injury	Number Of Patients	%	P-value
Open globe	28	25	0.0005
Open globe + adnexal	7	6.25	
Close globe	20	17.86	
Close globe + adnexal	7	6.25	
Adnexal	38	33.93	
Chemical	12	10.71	
Total	112	100	



Visual Outcome Of Ocular Trauma Patients

None of the patients reported a pre-existing history of reduced vision before ocular injury and on initial assessment, (n=50) were blind in the injured eye following trauma. Following primary treatment, the proportion of monocular blindness by the 6 months dropped to (n=2).

Table IV: Follow- Up Of Visual Acuity

WHO Classification Visual impairment	At Presentation	At 1 week	At 2 weeks	At 3 months	At 6 months
Normal (6/6-<6/18)	29 (26.22)	69 (66.1)	33 (56.0)	16 (41.0)	14(63.6)
Moderate (6/18-<6/60)	17 (15.78)	12 (11.52)	7 (11.9)	5(13.0)	4(18.0)
Severe (6/60-<3/60)	2 (1.74)	4 (3.85)	3 (5.0)	3 (7.7)	2(9.0)
Blind (3/60-NPL)	50 (43.48)	13 (12.5)	13 (22.1)	13 (33.4)	2(9.0)
VA not done	14 (12.78)	6(6.03)	3 (5.0)	2(4.9)	0 (0.0)
Total	112 (100)	104 (100)	59 (100)	39 (100)	22 (100)

The majority of eyes 89 (79.46%) had no complications recorded and corneal opacity 14 (12.5%) was the commonest complication of ocular trauma.

Graph II. Long Term Complications

DISCUSSION:

112 patients with ocular trauma were studied out of which the majority 89 (79.46%) were male and 23 (20.54%) were female giving a male-to-female ratio of 3.9:1, as per **(Table I).** This difference in males and females was statistically significant (P value<0.05) The predominance of males to ocular trauma is similar to that found in other studies, there were 74.50% males compared to studies by Desai et al.,[11] Cillino et al.,[12] and Emem and Uwemedimbuk[13] who had 83%, 84.6%, 74%, and 61.4%, respectively. This higher frequency of ocular trauma in males seen in our study population occurred in all age groups and it is thought to be related to occupational exposure, participation in dangerous sports and hobbies, alcohol use, and risk-taking behavior.

The age range in this study was 1.5 months to 76 years with a median and a mean of 28.30±19.86 years. Most of the patients seen with ocular trauma were in the 26-40-year age group (25.89%) followed by the 41-60-year age group (19.64%) and the 0-6-year age group (16.1%), as per (**Table I).** This is in keeping with other studies, the most common age group was 16-25 years with 35% of patients (mean age 28.53 ± 23.67

years) compared to 21-50 years (63.1%) by Emem and Uwemedimbuk [13] 33 years mean age by Cillino et al.[12]. Of concern is the age groups 0-6 years 18 (16.1%) because of the high risk of amblyopia and the many disability-adjusted life years ahead of them if these injuries are not managed appropriately.

In our study, the majority of 29 (25.89%) groups in whom ocular trauma occurred mostly at home followed by injuries at the workplace 28(25%), followed by chemical falls 12 (10.71%) and fireworks 11 (9.82%), RTA 9 (8.03%) as per **(Table II).** Desai et al. [11] reported the home as the most common place for a serious injury to occur (30.2%), followed by the workplace (19.6%), and a sports or leisure facility (15.8%). In a study by Emem et al.[13] the most common causes of injury were assault (62.2%) followed by RTA. Qi et al. [14] reported firework related (24.5%), and RTA (24.2%) related as the most common causes. The wide variation in the causes of injury may be due to the patient profile selected in various studies. In our study, most of the patients were from industrial areas, so chemical injury incidences are high. The limitations of this study were the small sample size. Despite the high risk of occupational injuries associated with manual work, there was no record of use or non-use of eye protective wear. Desai et al showed the home to be the commonest setting for injury in the UK. Injury in the home occurred during the collection or chopping of firewood, home chores, and child play.

The most common agent of trauma was iron rod 17 (14.28%), as per **(Table II).** This finding is consistent with other studies done in India, MTRH Kenya, and Ghana but different from the findings of a study done in Anwar Paracha Eye Hospital, Pakistan where sharp objects were the most common (71.4%) agent of trauma.

In this study, unilateral eye trauma was more common 109 (97.32%) and bilateral eye injuries were only 3 (2.68%). This is similar to 97.5% in South Africa and 90.7% in Ghanawhere the majority of injuries were unilateral. The bilateral injuries in this study were associated with chemical agents, RTA, and fireworks. The unilateral eye trauma seen highlights the fact that trauma is an important cause of monocular blindness. Our study did not show a significant association between the involvement of either eye, the right eye was injured in 47 (41.96%) patients and the left eye in 62 (55.36%) patients, and in a study done in Uttarakhand, India 2013 the left eye was involved in 84 (50.9%) and the right eye in 72 (43.6%).

In our study the majority of patients 98 (87.5%) presented within 24 hours of injury, followed by 6 (5.36%) who presented within 2 days, **(Table I).** In a study by Emem and Uwemedimbuk, [13] 18.6% of the trauma cases were reported within 24 h of injury, 39.1% within 1 week, 22.2% reported between 1 week and 1 month, 13.2% after 1 month, and 4% did not recall when they had the injury. In a study by Qi et al., [14] 83.6% of cases were reported within 24 hours of injury. The wide variation between different studies may be because of differences in accessibility of medical facilities and patient literacy in various areas where the studies were carried out. The higher numbers in presentation within 24 hours in this study are attributed to the that there is a free ambulance service in the country to take people to the hospital in cases of emergencies. In our study, adnexal injuries were more common accounting for 38 patients (33.93%) and open globe injuries accounted for 28 patients (25%), closed globe injuries for 20 patients (17.86%) as given in **(Table III).** In a study by Qi et al., [14] on hospitalized cases of ocular trauma 15.7% had closed-globe injuries, and 76.9% had open-globe injuries. Soliman and Macky [15] reported 19.6% closed-globe injuries and 80.4% open-globe injuries. Pandita and Merriman [16] reported 69.1% closed-globe injuries and 30.9% open globe injuries.

The intervention, medical treatment alone for patients in this study was (41, 36.06%), while in a study done in Central Ethiopia where 66.8% of the patients were managed with medication only. In this study,71 (63.04%) required surgery compared to 77% by May et al. [17] Depending on the severity of injuries, surgical procedures were done. 25 (22.32%) patients had repair of corneal / sclera wound, 1 patient (0.89%) had an intravitreal injection of antibiotics (Vancomycin & Ceftazidime) and Dexamethasone on the 1st day of admission, 18 patients had canaliculi intubation (16.07%), 16 patients had repair of conjunctival wound (14.3%), 12 patients had repair of lid wound (10.7%), 2 (1.8%) patients had orbitotomy and 1 patient (0.89%) had AMG followed by SLET for chemical injury.

Visual acuity in the injured eye at presentation was recorded in 98 (85.2%) of the injured eyes and not recorded in 14 (12.5%) which were mostly children below the age of 5 years. The majority 50 (43.48%) of eyes were blind, 29 (26.22%) had normal visual impairment and 17 (15.78%) eyes had moderate visual impairment at initial presentation according to the WHO classification of visual acuity in the injured eye. This is consistent with other studies in Ghana by Bonsaana et al. and in South Africa by Sukati et al. where 18.7% and 29.2% were blind at initial presentation. This emphasizes the need to strengthen prevention strategies for ocular trauma as poor visual acuity at presentation has been shown to be associated with poor visual prognosis.

Follow-up pattern over a 6-month period showed that follow-up was high in the first two (2) weeks (104) coming for follow-up. After that, there was a quick decline in follow-up, a finding consistent with that found by Momanyi et al of a high loss to follow up, especially with the out-patient clientele, and findings by Bonsaana et al. who found that patients with monocular blindness following trauma were more likely to come for follow up compared to those with normal vision ($p<0.01$). This loss in follow-up may be due to the that most patients seen as outpatients had minor injuries associated with normal visual acuity, recovered quickly and needed no further management, whilst patients with a severe visual loss after trauma are more likely to come for follow-up. Some patients may have decided to continue to follow up at local health facilities due to financial constraints.

Looking at the visual acuity over a 6-month follow-up period in this study there was an improvement in visual acuity over the first 2 weeks of follow-up with an increase in eyes with normal visual acuity (6/6-<6/18) increasing from 26.22% at presentation to 66.1% at the 2 -week review and patients with vision ≤ 3/60 reducing from 43.48% to 12.5%. Though 9% of the patients were still blind according to WHO classification on the injured eye at the 6 -month follow-up, there was a statistically significant improvement in visual acuity at presentation and last, follow-up ($p<0.001$).

The majority of 89 (79.46%) of traumatized eyes did not have complications due to the ocular trauma at their last follow-up, 23 (20.53%) had complications reported at the last follow-up. The most commonly seen complication was corneal scar 14 (12.5%) followed by traumatic cataract 4 (3.57%), retinal detachment 1(0.89%), secondary glaucoma 1(0.89%), unresolved VH 1(0.89%), post synechiae 1(0.89%) and uveitis 1(0.89%). These findings are consistent with those of Bonsaana et al. in Ghana where corneal opacity was 10.6% and Momanyi et al in MTRH Kenya who found corneal opacities accounted for 16.7% of their complications.

CONCLUSION:

Ocular trauma is 3.9 times higher in males than females. The most predisposed are the economically active age groups 26-40 years followed by the age group 41-60 years. Home and workplace were the most common places of occurrence of trauma while the iron rod was the most common agent causing trauma. About one-fifth were blind or visually handicapped in the affected eye at presentation. Adnexal injuries were most common followed by open globe injuries. The most common intervention was medical treatment alone followed by corneal wound repair. There was a high loss of follow-up for patients with normal visual acuity. There was a significant improvement in visual acuity ($p<0.001$) at the last follow-up. Whilst the majority of eyes did not have complications, the most recorded complication was corneal opacity.

Ocular trauma is a grave cause of ocular morbidity and mortality. Prompt transfer to a good eye facility, early investigations, and management are key features to prevent permanent visual loss. Resources should be mobilized to provide quality ocular emergency care. There is a need for prevention strategies to target young people including students and males, by promoting public awareness of the prevention of ocular trauma and emphasizing the use of protective eyewear in the workplace and at the home. Personal protective equipment (PPE) is equipment that will protect workers against risk in the workplace.

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