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Original Research Article

Epidemiology, types and clinical features of cases of ocular injuries attending a tertiary care teaching hospital of Eastern India

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ABSTRACT

Background: Ocular trauma is one of the main causes of severe ocular morbidity. The goals of this study were to describe epidemiology, causations, clinical features of ocular trauma, to analyse visual outcomes of ocular trauma.
Methods: The patient was enquired about the time of occurrence of the injury, place, types of injury inflicted, any prior trauma or surgery, any treatment received before attending to the hospital. Visual acuity of each eye was recorded by using Snellen's chart. In patients with poor vision gross assessment was done by counting fingers at specific distance, hand movements, perception of light present or not, projection of rays- accurate or not. Ocular motility testing was done in all patients.
Results: Patients suffering from ocular injuries in one or both eyes, were examined clinically at the eye department of R G Kar Medical College and Hospitals, Kolkata, from December 2011 through August 2012. Approximate 757 persons had injury in one eye and 100 had injuries in both eyes (totalling 957 eyes with injuries in 857 patients). Males, 640 (74.7%) had more number of injuries than females 217 (25.3%) and injury was more common between 21 and 50 years of age groups in both sexes.
Conclusions: A significant burden of ocular trauma in the community requires that its prevention and early management be a public health priority.

Keywords: Blindness, Eye injury, Ocular trauma, Open globe and closed globe, Visual deficit

INTRODUCTION

Eye injuries are major cause of disabling ocular morbidity in developing countries. Up to 5% of all bilateral blindness occurs due to direct result of trauma.[1] Ocular trauma is one of the main causes of severe ocular morbidity. Globally, more than 55 million eye injuries occur per year, while there are approximately 1.6 million people with blindness from ocular trauma, 2.3 million people who are bilaterally visually impaired, and 19 million people with unilateral blindness or visual loss.[2-4] Decrease or loss of vision, either monocular or binocular, may result in significant economic burdens to families and countries due to time lost from work, or school, and family care giving, expensive hospitalization, special visit and treatment, prolonged follow-up, and visual rehabilitation. Because of the severity of visual impairment of ocular trauma, complete ocular trauma statistics and authoritative data should be collected. According to an estimate under the WHO programme for the prevention of blindness the incidence of open globe injuries in the World are about 2 lakhs cases per year which were largely preventable. Survey of large city-based hospitals shows that a huge number of patients

either presents themselves or referred from remote areas to these hospitals causing a constant pressure on those related to eye care delivery system. It is also a major socioeconomic and psychological impact on the patients and their families. Full enquiries about these ocular injury patients are essential to take precautionary measures in future to prevent their occurrences. Nearly 90% of eye injuries can be prevented by relatively simple measures.[5]

There are some natural defensive mechanisms to the eye i.e. strong bony orbital walls, eyeballs remaining in a cushion of fat and movable eyelids covering the eye balls, still ocular injuries are quite common. Children are more commonly injured than adults due to their curiosity and underdeveloped motor skills. Nearly 90% eye injuries can be prevented by relatively simple measures.[5,6] However, the use of ocular - protective devices in India is very low.[7] Various studies on ocular trauma in developed and developing countries have been conducted. There is a lack of data regarding pattern of eye injuries in developing countries.[6-8] This necessitated to conduct this study.

Ocular injuries have been studied by various investigators in terms of its causative factors, age of incidence, gender predilection, and place of injury, types, preventive measures and prognostic factors. The present study was undertaken at the eye department of R G Kar Medical College and Hospital (OPD, indoor and emergency) with a view to rationally observe the details of the injuries which are essential for a planning of future preventive management.

METHODS

A study on ocular injuries was undertaken at RG Kar Medical College and Hospital, Kolkata during the period between December 2011 and August 2012. This was an observational case series. Patients attending the hospital with ocular injuries at indoor, outdoor, emergency and fulfilling the inclusion criteria (injuries older than two weeks were excluded) within the stipulated time period were included. Written informed consent was taken from each patient on printed form from each patient before the examination was done.

The patient was enquired about the epidemiological data, time of occurrence of the injury, place, type of injury inflicted, any prior trauma or surgery, any treatment received before attending to the hospital. A detailed clinical examination was undertaken. Visual acuity of each eye was recorded by using Snellen's chart.

In patients with poor vision gross assessment was done by counting fingers at specific distance, hand movements, perception of light present or not, projection of rays accurate or not. In infant's fixation of light and smooth pursuit was assessed with a torch light. In few cases pin-hole acuity was taken. Ocular motility testing was done in all patients.

The globe was examined for any laceration, luxation and rupture; any intraocular foreign body, any exophthalmos or enophthalmos and phthisis bulbi. Any conjunctival foreign body, tear or laceration, subconjunctival hemorrhage and discharge were noted.

Corneo-scleral injuries particularly foreign bodies, abrasions, cut injuries; oedema, ulcer etc. were noted. Anterior chamber depth and contents were noted. The estimation of the angle of the anterior chamber was done by Van Herick's test under a slit lamp. Gonioscopy could not be done in any patient on the first time of appearance. The lens was examined for any subluxation, dislocation, any opacity or any sign of extrusion of the lens.

The posterior segment examination was done either with undilated pupil or with dilated pupil as situation permitted. A direct ophthalmoscopic examination was done in most of the patients. Any vitreous hemorrhage, retinal oedema, macular oedema etc. were noted.

The orbit was examined for any fracture that could be noted on palpation. Ocular movements were noted. Data were recorded on a pretested proforma and was analyzed in software EPIINFO 6.04. Statistical calculations were done using Epitable calculator. Chi2 test was applied to compare data; a p value of <0.05 was considered significant.

RESULTS

In this prospective observational case series, 857 patients with injury either in one eye or both eyes were clinically examined between December 2011 to August 2012. The Mean±SD age of the participants was 29.31±16.56 years. Mean±SD age for the males was 30.13±16.25 years and that for the females 26.9±17.26 years did not differ significantly (p=0.273).

Males, 640 (74.7%) suffered more than the females, 217(25.3%); ($p<0.001$). The patients' demographic data as to the age, sex, residence, educational status and occupation (n=857) were shown (Table 1, 2).

Table 1: Patients' demographic data (age and sex).

Age group (years)	Males (%)	Females (%)	Total (%)
0-10	86 (62.8)	51 (37.2)	137 (16.0)
11-20	95 (72.0)	37 (28.0)	132 (15.4)
21-30	161 (79.7)	41 (20.3)	202 (23.6)
31-40	141 (78.7)	49 (25.8)	190 (22.2)
41-50	85 (78.7)	23 (21.3)	108 (12.6)
51-60	51 (87.9)	7 (12.1)	58 (6.8)
61-70	15 (65.2)	8 (34.8)	23 (2.7)
71-80	4 (100.0)	0 (0)	4 (0.5)
>81	2 (66.7)	1 (33.3)	3 (0.4)
Total	640 (74.7)	217 (25.3)	857

Table 2: Patients' demographic data (residence, educational status and occupation).

Place of residence	No.	%
Urban	573	66.9
Rural	281	32.8
Slum	3	0.4
Educational status		
Illiterate	84	9.8
Below higher secondary	725	84.6
Graduate	40	4.7
Post graduate	8	0.9
Occupational status		
Student	235	27.4
Housewife	141	16.5
Cultivator	47	5.5
Businessman	174	20.3
Teacher	2	0.2
Lathe machine worker	81	9.5
Laboratory technician	1	0.1
Stonecutter	7	0.8
Carpenter	7	0.8
Others	161	18.8

Blunt trauma occurred in 320 (50%) males and 108 (49.7%) females (p=1.000); Extra ocular foreign bodies were seen in 141(22.0%) males and 30 (13.8%) females (p=0.28) and injury with sharp instruments occurred in 58 (9.1%) males and 30 (13.8%) females (p=0.748). There was no statistically significant difference in the abovementioned three major types of ocular injuries in males or females.

There was no statistically significant difference in the abovementioned three major types of ocular injuries in males or females. All types of injuries were predominant amongst males. Injury by moist burn (hot liquid like water, tea, milk etc.) was higher in females. Insect bites, though higher in males, are also marked in females. The causes of injuries by place of occurrence and gender are shown (Table 3).

Injuries were noted in one eye in 757 patients and both eyes in 100 patients making number of injured eyes 957 in 857 persons. Again, a single patient might have injuries at multiple structures of the eye making the list of injuries a long one (Table 4).

Table 3: The causes injuries by place of occurrence and gender.

Cause of injury	Place of occurrence	No.	Sex		Total (%)
			Males	Females	
Blunt injury	Home / playground		92 (77%)	27 (22.7%)	119 (13.9)
Blow from fist	R T A	119 (100 %)	228 (73.8%)	81 (26.2)	309 (36.1)
Hit against solid object and cracker	Playing cricket	114 (36.9%)			
	Elsewhere	31 (10.0%)			
	School /home	160 (51.8%)			
	stove burst	4 (1.3%)			
Sharp /pointed object	Factory	10 (11.4%)	58 (65.9%)	30 (34.1%)	88 (10.3)
	R T A	2 (2.3%)			
	School /home	46 (52.3%)			
	Elsewhere	30 (34.9%)			
Corrosive burn					
Acid	Factory	1 (7.1 %)	9 (64.3%)	5 (35.7%)	14 (1.6)
	Laboratory	3 (21.4%)			
	Elsewhere	10 (71.4%)			
Alkali	Factory	3 (8.6%)			
	Laboratory	1 (2.9%)			
	Elsewhere	31 (88.5%)			
Colouring agent	Factory	1 (2.9%)	28 (82.4)	6 (17.6%)	34 (4.0)
	Home /school	33 (97.0%)			
Dry burn	Factory	3 (10.7%)	20 (71.4%)	8 (28.6%)	28 (3.3)
	Home /elsewhere	25 (89.2%)			
Moist burn (hot water)	Home	9 (100.0%)	3 (33.3%)	6 (66.7%)	9 (1.1)
Arc welding	Factory	18 (90 %)	18 (90.0%)	2 (10.0%)	20 (2.3)
	Laboratory	2 (10%)			
EOFB	Factory	66 (38.6)	141 (82.5%)	30 (17.5%)	171 (20)
	Laboratory	1 (0.6%)			
	Elsewhere	104 (60.8%)			
IOFB	Factory	1 (100%)	1 (100%)	0	1 (0.11)
Insect / other bites	Undetermined	-	14 (60.9%)	9 (39.1%)	23 (2.7)
Vegetable matter	Undetermined	-	4 (80.0%)	1 (20.0%)	5 (0.6)
Unknown	Elsewhere	1 (100%)	1 (100%)	0	1 (0.11)

RTA = Road Traffic Accident; EOFB = Extra Ocular Foreign Body; IOFB = Intraocular foreign bod, undetermined = could not remember, Elsewhere = at different places

Table 4: Injuries to the lid, globe and structures in the anterior segment.

Structures	Type of injury	Right eye [No (%)]	Left eye [No (%)]	Total
Eye lids	Cut margin	84 (9.8)	55 (6.4)	139
	Cut margin (including punctum)	1 (0.1)		
	Thr'gh	5 (0.6)		
	Thr'gh cut	254(29.6)		
	Others (minor)			
Globe	Rupture Retrobulbar	17 (2.0)	12 (1.4)	29
	haemorrhage	-	5 (0.6)	5
	Enophthalmos	-	2 (0.2)	2
Conjunctiva	Tear	12 (1.4)	8 (0.9)	20
	S/Conj haemorrhage	239 (27.9)	223 (26.0)	462
	Foreign body	37 (4.3)	28 (3.3)	65
Cornea	Epithelial abrasion	215 (25.1)	196 (22.9)	411
	Stromal oedema	3 (0.4)	3 (0.4)	6
	Partial thickness cut	2 (0.2)	4 (0.5)	6
	Full thickness cut	16 (1.9)	11 (1.3)	27
	Foreign body Corneal	141 (16.5)	106 (12.4)	247
	ulcer	3 (0.4)	---	3
Sclera	Laceration	------	1 (0.1)	1
Anterior chamber	Shallow	27 (3.2)	15 (1.8)	42
Depth anterior chamber content	Deep	6 (0.7)	1 (0.1)	7
	Hyphema	22 (2.6)	14 (1.6)	36
	Hypopyon	7 (0.8)	2 (0.2)	9
Iris	Traumatic iridocyclitis	35 (4.1)	17 (2.0)	52
	Foreign body	1 (0.1)	------	1
Pupillary abnormalities	Miosis	7 (0.8)	6 (0.7)	13
	Mydriasis	26 (3.0)	9 (1.1)	35
	Eccentric	29 (3.4)	16 (1.9)	45
Angle of A/C (torchlight/SL exam)	Absent reacn (direct)	29 (3.4)	15 (1.8)	44
	Absent reacn (consens)	29 (3.4)	15 (1.8)	44
	Abnormalities	0	0	0
	Detected	370 (43.2)	404 (47.1)	774
	Could'nt be Adequately examined			
Lens	Sublux/dislocn	1 (0.1)	-----	1
	Opacity	23 (2.7)	13 (1.5)	36
	Lens matter in A/C	1 (0.1)		1
	Couldn't be adequately examined	43 (5)	37 (4.3)	80

*a single eye could have multiple injuries

Table 5: Injuries to the structures in the posterior segment.

Structures	Type of injury	Rt eye [No (%)]	Lt eye [No (%)]	Total
Vitreous	Haemorrhage couldn't be adequately examined	6 (0.7)	2 (0.2)	8
		57 (6.7)	48 (5.6)	105
Retina	Haemorrhage couldn't be adequately examined	1 (0.1)	---	1
		62 (7.2)	49 (5.7)	111
Optic nerve	Disc oedema	1 (0.1)	-	1
	Sheath hematoma couldn't be adequately examined	1 (0.1)	-	1
		107 (12.5)	91 (10.6)	198
Orbit	Rim fracture	3 (0.4)	4 (0.5)	7
	Blow-out fracture couldn't be adequately examined	7 (0.8)	6 (0.7)	13
		48 (5.6)	37 (4.3)	85
Ocular movements	Restricted couldn't be adequately examined	12 (1.4)	13 (1.5)	25
		33 (3.9)	29 (3.4)	62
Intraocular pressure	Low	12 (1.4)	9 (1.1)	21
	High	8 (0.9)	4 (0.5)	12

*A single eye could have multiple injuries

Lid injuries of all types (488) were one of the major causes for patients attending the hospital. Patients with other minor injuries attended were sub-conjunctival haemorrhages (462), epithelial abrasions of the cornea (411), and superficial foreign bodies on the cornea (247) (Table 4). In the posterior segment, a good number of eyes could not be examined adequately. As the patients this study were examined for once only at first presentation, only few injuries could be identified. Vitreous haemorrhage (8), orbital fractures (20) were the important ones (Table 5). Blindness from injury (i.e., bilateral blindness at presentation) was seen only in one patient, and 50 persons had unilateral blindness (Table 6). Whatever the type of injury, most patients applied plain water as the commonest application (Table 7).

Table 6: Eye affected and the visual status of the patients.

Eyes affected	No. of patients	%
One eye	757	88.3
Both eyes	100	11.7
Blindness (at presentation)		
One eye blind#	50	12.94
Both eyes blind##	1*	0.1

an eye was considered blind if visual acuity was worse than 6/60 at presentation, ## A person was considered blind if visual acuity in the better eye was worse than 6/60, All assessments were done once on first presentation only, *Due to dry burn from flame when a stove burst accidentally

Table 7: Comparison of distance from an eye care facility and the time interval of presentation for treatment.

Distance (Km)	Day 0	Duration			
		Day 1-3	Day 4-7	Day >7	p-value
0-5	291 (62.6%)	153 (32.9%)	18 (3.9%)	3 (0.6%)	0.001
6-10	78 (60.5%)	44 (34.1%)	7 (5.4%)	0	0.001
11-15	50 (52.63%)	35 (37.9%)	10 (10.5%)	1 (1.1%)	0.04
>15	82 (48.8%)	60 (35.7%)	22 (13.7%)	3 (1.8%)	0.001
Total	501 (58.45%)	292 (34.07%)	57 (6.65%)	7 (0.81)	

Table 8: History of treatment.

Treated before presenting	Percentage
Wash with water	732 (85.4%)
Topical antibiotics	36 (4.2%)
Topical application (others)	85 (9.9%)
Surgery	4 (0.5%)
Treatment records available	102 (11.9%)

DISCUSSION

In the present study people attended mostly from urban area (66.9%) and rural areas (32.8%); and only 3(0.4%) from urban slum. The hospital where the study was undertaken placed in a megacity. Everyday patients attend this hospital from all areas of the city, the other parts of the district and also the state of West Bengal. Areas beyond the city have both types of people living in rapidly urbanizing areas or still rural areas. So, findings as to the nature, types and causes of injuries in this study differed on many situations in studies reported exclusively from rural population or from developed countries like Singapore.[9-12]

Mean±SD age for all patients was 29.31±16.56 year in this study. In most studies the mean age varied between the twenties and thirties.[11,13,14] Mean age for the males and that for the females did not differ significantly (p=0.273), a finding similar to that observed in APEDS study.[12] Males, 640 (74.7%) suffered more than the females, 217(25.3%); p<0.001.

Injury was more common between 21 and 40 years of age groups in both sexes which are corroborative with the findings in Singapore study.[11,15] Generally, they are the working groups and more exposed to injuries. Again, above 50 years of age, when people are engaged less and less in works and mostly remain inside houses, their number becomes also less amongst the persons in the injury list. Though, the number of males and females appearing with eye injuries varied (74.7% males compared to only 25.3% females), yet the proportion of injuries in different age groups in either sex group was comparable. A male preponderance was reported by almost all authors working on ocular injuries.[13-19] All types of injuries were significantly predominant amongst males (p <0.01).

Injuries were common amongst children at schools or people at home and in people living in urban areas (p <0.05). Injuries in children while playing at home or in schools were reported by many authors.[21,22] Injuries occurred mostly at the patients' workplace in this series was also reported by others.[6] Two studies from south India reported more injuries in agricultural labourers as those were conducted done in rural settings, but in their urban patients most of the injuries were noted in people while playing. Injuries were noted more in people with lower levels of education (p<0.0001) in the present study which was consistent with other studies worldwide.[9,10]

Blunt trauma occurred in 320 (50%) males and 108 (49.7%) females (p=1.000) which corroborates with the findings of a population-based study in rural south India

and other studies.[5,18] Extra ocular foreign bodies were detected in 141 (22.0%) males and 30 (13.8%) females (p=0.28). Injury with sharp instruments occurred in 58 (9.1%) males and 30 (13.8%) females (p=0.748). There was no statistically significant difference in the three major types of ocular injuries in males or females. Extra-ocular foreign bodies were reported in only 4.5% patients in Singapore study.[11] In this series contusion and lamellar lacerations were the majority and corresponds with the report from the United States where majority of injuries occurred at home and contusions and abrasions were the commonest type of injuries.[23] Open globe injuries were seen only in 6.7% of the subjects which is in contrast with a 33.2% incidence in an Indian subset in the Singapore study.[11]

Injury by blunt objects (36.1%), by sharp/ pointed objects (10.3%) can be compared to that reported as 42% and 36.4% respectively in the Singapore Indian eye study.[12] But injury due to corrosive burns in the present study (4.1%) differed widely (15.4%) in the same study. Intraocular foreign body (only 1 case) was seen in this series. This is usually associated with industrial trauma, construction works, lathe machine workers, stone cutters or war injuries. Though there were 573 (66.9%) persons from urban areas (industrial areas), the only case of IOFB in these 857 participants was unusual. This is in sharp contrast to that reported from an industrialized urban area in Singapore where nearly 15% of the injuries were due to intraocular foreign bodies or, an Army General Hospital in China.[11,24] However, the number of people those get such type of injuries (stone cutters-7, lathe machine workers-81) were also very less in the present series.

Patients were examined, and data recorded only once and at first presentation. Further follow up and management were not in the scope of this study. So, even if any perforating injury was there, it could not be confirmed during the first examination. According to the standardized classification of ocular trauma 7 all the ocular injuries presented in this study were categorized in the following way: (No. of eyes one eye 757 and both eyes (100) totaling 957 eyes). Open globe injuries (7.25%) occurred more in young individuals (mean age 34.09 years) and in males (83.6%).[16,25] On first presentation blindness in one eye (<6/60) was noted in 50 (12.94%) eyes. Only one eye of the total 957 eyes examined was blind. This should not be concluded as the ultimate effect of the trauma as there was no follow up done. Trauma in both eyes was very less compared to one eye trauma.[14,26]

Table 9: Classification of the ocular injuries.

Closed globe injuries (N=799)		Open globe injuries (N= 58)			
Contusions (534)	Lamellar lacerations (365)	Lacerations			Rupture
		Penetrating	IOFB	Perforating	
		28	1	Nil	29

Forty percent patients attended to a Mymensingh hospital within 60 hours of ocular trauma while in the present study 58.45% patients arrived at the hospital within 24 hours and a further 34.07% patient in 48 hours. 85.4% patients applied water in the eyes after any injury to get relief.[27] Only 4.2 % had some antibiotic eye drop and another 9.9% some other eye drop as a treatment; the details could not be elicited due to non-availability of the documents except in 11.9% of cases. This observation also differed from that reported by the Aravind study group where nearly 75% of the patients with ocular injury sought some sort of treatment.[9] Though some knowledge about prophylaxis or primary care after injury was reported by 35.4% of the patients, protective glasses were used by only 0.6%. Similar reports are available in the literature.[22] Access to emergency care and at their workplaces was available to 54.4% and 54.7% of the patients. Preventive methods particularly in children in schools and factory workers may diminish many injuries.[23,26]

This study had its limitation that all patients with ocular injuries attending the hospital could not be included. So, it would not be considered as a prevalence study but a case series. The patients were examined only once at the first presentation. The number of cases, the varied type of injuries noted, and the varied types of data collected during the study, would help in getting an impression about the types, causation, and the relationship of different socio-educational status on injuries. These findings may be important for recommending future plans for managing injuries and also preventing blindness due to trauma. The most important is to conduct a well-designed study on this most important issue.

CONCLUSION

Susceptible population of eye injuries were middle- and young-aged working groups, and the proportion of males was higher. The leading two types of ocular trauma were work-related and home-related.

It is therefore recommended that efforts should be invested in education for eye protection in order to prevent ocular trauma in the young- and middle-aged working groups, and that eye injuries research and prevention could be further aided by a nationwide collaborative registry of eye injuries in India.

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