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Research Article

Current Pattern of Ocular Trauma – A Study in a Tertiary Care Centre

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ABSTRACT

Background – Ocular trauma a significant cause of the visual impairment and blindness globally. It is varies in certain demographics and regions. A large number cases is reported every year.
Aims – To study the current causes and types of ocular trauma and its distribution according to age and sex.
Material and Methods- The patients attending at Assam Medical College and Hospital, Dibrugarh with ocular trauma fulfilling the inclusion and exclusion criteria during the study period included in this study. The distribution of ocular trauma was tabulated according to age, sex, laterality, cause of trauma, type of trauma, visual acuity and type of treatment required. Finally, the results of this study were summarized and a conclusion derived from the clinical analysis of observations made during the study.
Results- In this study 100 patients and 113 eyes were included. Male female ratio was 3.4:1. Highest number of ocular trauma observed in 20-29 years age group (29%). Unilateral injury was higher than bilateral injury (87%). Close globe injury was 71% and open globe injury was 29%. Road traffic accident (22%), mechanical cause (22%) and agriculture related injury (21%) were the common cause ocular trauma.
Conclusion- Industrial cause as well as agricultural causes were the common cause in this region. Male were more involved ocular trauma and the common age group was 20-29 years. Awareness regarding possible causes of ocular trauma and adequate safety measures are important for prevention of ocular trauma.

Keywords*: ocular trauma, blindness, close globe injury, open globe injury, visual acuity,*

INTRODUCTION

Ocular trauma is a leading cause of blindness and visual impairment worldwide. It is more common in developing countries. It is estimated that 2.4 million ocular trauma occur worldwide annually.[1] In the year 1998 it was found that around 3.9 million people were reported to have bilaterally blindness or visual impairment, and more than 19 million having visual impairment or blindness unilaterally.[2] In India, it is reported that incidence of ocular trauma varies from 1-5%.[3] The etiological factors of ocular trauma and the presentation of ocular trauma has altered or modified by Industrialisation and urbanisation. Type of work and working habits influences workers' ocular trauma. Ocular trauma is varies in certain demographics and regions. In the present study the place of study is surrounded by tea plantation workers and paddy field workers along with a few industrial workers. Tea garden workers have more chances of exposure to injury during work in the garden and factory. Incidences of injury is more during harvesting season for the farmers. Injury can occur by instruments, chemicals, insects bite or by road traffic accident. Moreover, some traditional habits are also causing ocular trauma among tea garden populations. Many people are engaged in tea industry in upper Assam. Most of the ocular trauma have been reported among tea garden workers. It has been observed that causes of ocular trauma can be prevented among the workers by adequate safety measures as well as by awareness. Mass awareness regarding potential risk factors of ocular trauma can be prevented numbers of ocular trauma.

Involvement of different structures of the eyeball can be occurred following eye injury corneal laceration, hyphaema, iridodialysis, post traumatic glaucoma, traumatic cataract, vitreous haemorrhage, retinal detachments, scleral rupture, globe rupture etc. As per BETT (Birmingham Eye Trauma Terminology) ocular trauma divided into Open globe injury and Closed globe injury. Open globe injury is defined as a full thickness wound of the eye ball, due to either a laceration or an occult rupture.[4] Closed globe injury is defined as when the eye wall is not penetrated, but the eye structures are damaged which is mainly caused by blunt trauma. Involvement of ocular Zones in Open globe injury is an important prognostic factor for visual potential. Zone I- trauma involves the cornea and limbus. Zone II- trauma extends posteriorly from limbus up to 5mm posterior to the limbus where deeper structures including lens and zonules. Zone III- trauma extends more than 5mm posterior to the limbus, involving the retina, optic nerve and choroid.[5] Analysis of pattern of ocular trauma is helpful in identifying the risk factors and planning strategies for the management of ocular injuries.

In this study the epidemiological data of ocular injuries of Dibrugarh district of Assam has been highlighted. The study has taken into consideration of the causative agents of ocular injuries, types of ocular injuries, their classification as per BETT (Birmingham Eye Trauma Terminology) and distribution of ocular injury according to age and sex.

Objectives of the study- The study has been conducted based on the following objectives-

1. To study the current causes of ocular trauma
2. To study different types of ocular trauma
3. To study the distribution of ocular trauma according to visual acuity, age and sex.

Materials and Methods

Place of study: Assam Medical College & Hospital, Dibrugarh Duration of study : One year; December 2023 to November 2024. Type of study : A Hospital-based observational study
Sample size : 100

Inclusion Criteria:

1. Age - 5 years and above
2. Both extraocular and intraocular trauma
3. Blunt trauma, laceration, ecchymosis, penetrating injury, perforating injury, close globe injury, foreign body and all vision threatening injuries

Exclusion criteria

1. Less than 5 years of age
2. Healed or old cases
3. Mild ocular injury like abrasion, redness, watering and irritation.
4. Mental illness, uncooperative patient, coma and orbital wall involvement.

The study was done after getting approval from the Institutional Ethical Committee of Assam Medical College, Dibrugarh, Assam on 6th October 2023. The patients attending at the Outpatient department and Casualty department of Assam Medical College & Hospital with ocular trauma fulfilling the inclusion and exclusion criteria during the study period were included in this study. An informed consent was taken after informing the details of the study to include in this study. All the patients more than 5 years of age of either sex of ocular trauma was taken as the sample of the study to see the common age group and sex preponderance of ocular trauma. Visual acuity was also recorded of all patients at the time of presentation. In this study 100 patients and 113 eyes were included as the sample of the study. The diagnosis was mainly based on the medical history and the clinical examination. Special investigations were done in some cases like in hazy media, suspected orbital wall fracture or retrobulbar pathology. Special investigations such as tonometry, keratometry, fundus photography, ultrasonography, CT scan and MRI were performed whenever necessary. The trauma cases has been classified as per Birmingham Eye Trauma Terminology (BETT) - A. **Closed globe** (a. Contusion b. Laceration) B. **Open globe** (a. Rupture b. Laceration – i. Penetrating ii. Perforating and iii. IOFB)

The distribution of ocular trauma were tabulated according to age, sex, laterality, visual acuity, causes of trauma, type of trauma and type of treatment. Finally, the results of this study were summarized and a conclusion derived from the clinical analysis of observations made during the study. The study discussed in detail with different relevant studies on the subject by other authors and clinically analysed. The data and results were tabulated and statistically analysed. software **Microsoft Excel 2010** was used for statistical analysis of data.

RESULTS

A total of 100 ocular trauma patients and 113 injured eyes was taken as the sample of the study. In this study it has been reflected that unilateral eye injuries (77%) were higher than the bilateral (13%) injury. 87% cases had unilateral eye injury (Right eye was involved 46% cases, left eye was injured 41% cases) and 13.0% had bilateral ocular injury.

Table1. Distribution of Ocular Trauma according to Age

AGE GROUP *(years)*	NUMBER *(n)*	PERCENTAGE *(%)*
5— 9	5	5
10—19	11	11
20—29	29	29
30—39	26	26
40—49	12	12
50—59	13	13
60—69	2	2
≥ 70	2	2
TOTAL	100	100

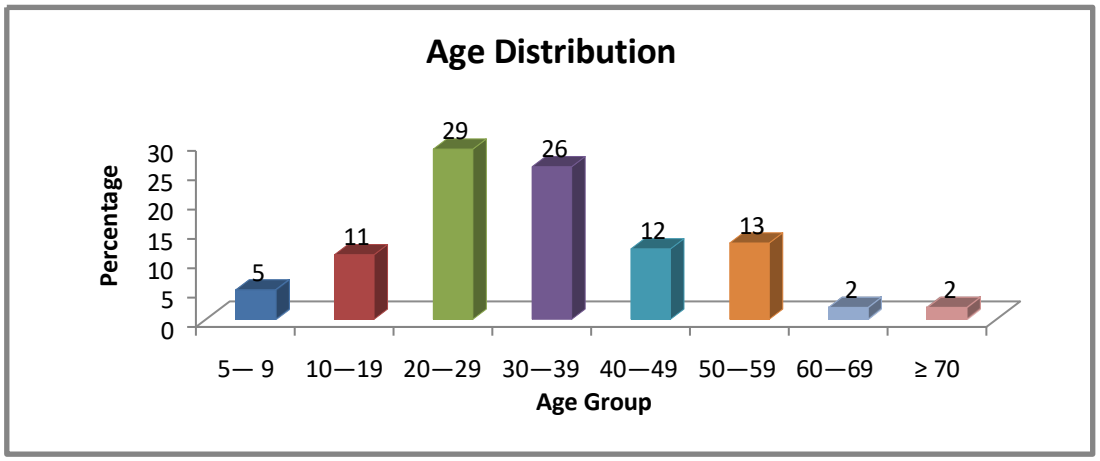


Fig-1. Distribution of Ocular Trauma according to Age

The above table and bar diagram shows the distribution of ocular trauma according to age. 5% in 5-9 years, 11% in 10-19 years, 29% in 20-29 years, 26% in 30-39 years, 12% in 40-49 years, 13% in 50-59 years, 2% in 60-69 years, 2% in more than 70 years.

Table 2:- **Distribution of ocular trauma according to gender**

Category	Percentage	Male : Female
Male	77%	3.4 : 1
Female	23%	

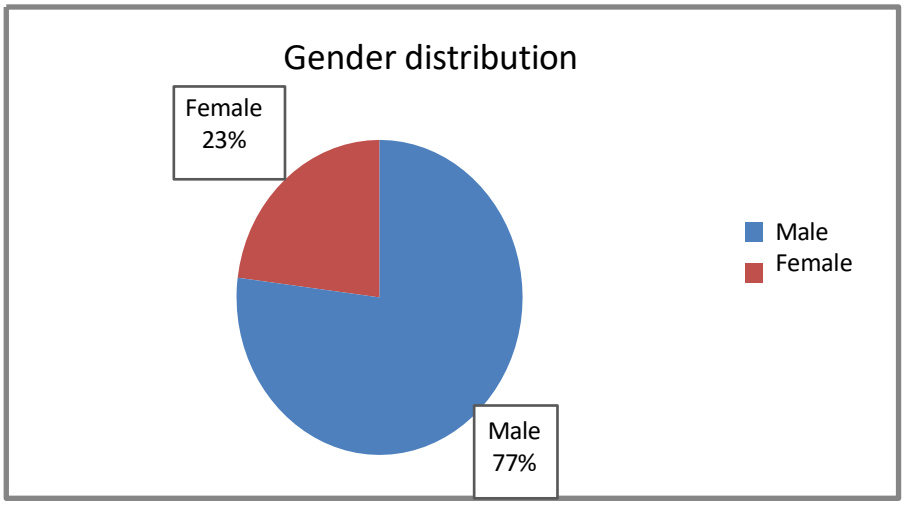


Fig-2. Distribution of ocular trauma according to gender.

The above table and pie diagram is showing- 77% cases of ocular trauma aer male and 23% caes are female . Male and female ratio was 3.4:1.

Table 3:- Distribution of Ocular Trauma according to Cause of Injury

Mode of injury		EYES (n)			TOTAL NUMBER OF PATIENTS	
		Right	Left	Both eye	N	%
Road traffic accident		8	9	5	22	22
Physical assault	Sharp injury	1	2	0	11	11
	Blunt injury	4	2	2		
Industrial injury	Mechanical Trauma	8	7	1	22	22
	Chemical injury	4	1	1		
Sports equipment		4	2	1	6	6
Animal injury		1	2	0	3	3
Fire related trauma		7	6	1	14	14
Agriculture related trauma		9	10	2	21	21
Total		**46**	**41**	**13**	**100**	**100**

The above table is showing the distribution of Causes of Ocular Injury. The most frequent causes of ocular trauma are Road traffic accidents and Industrial injury and both the causes accounting for same percentage (22%), followed by Agricultural injury that is responsible for 21% of trauma, followed by Fire related injury fire related trauma accounting for 14% cases. Other modes of injury such as sports related (6%). physical assault (11%) and sports related (3%).

Table 4: Distribution of Close Globe Injuries

TYPES	EYES (n)			TOTAL NUMBER OF EYES	
	Right	Left	Both eyes	N	%
Lid ecchymosis	5	6	6	17	17
Subconjunctival haemorrhage + conjunctival laceration	6	3	3	12	12
Lid laceration	6	7	2	15	15
Hyphaema	4	3	0	7	7
Traumatic cataract	3	4	0	7	7
Vitreous haemorrhage	3	2	0	5	5
Retinal detachment	1	0	0	1	1
Burn injury	3	3	1	7	7
Total	**31**	**28**	**12**	**71**	**71**

The above table is showing distribution of different types of closed globe injuries and it was observed that 17% patients presented with lid ecchymosis closely followed by lid laceration i.e. 15%. Subconjunctival haemorrhage with conjunctival laceration was seen in 12% cases. Other causes were Hyphaema (7%) Traumatic cataract (7%), Vitreous haemorrhage (5%) and Retinal detachment (1%).

Table 5. Distribution of Open globe injury

Category	Right eye	Left eye	Both eye	Total	%
Corneal laceration	6	6	1	13	13
Iris prolapse+ iridodialysis	4	2	0	6	6
Globe rupture	2	3	0	5	5
IOFB	0	1	0	1	1
Simple penetration	1	0	0	1	1

Corneal	2	1	0	3	3
laceration+traumatic cataract					
Total	**15**	**13**	**1**	**29**	**29**

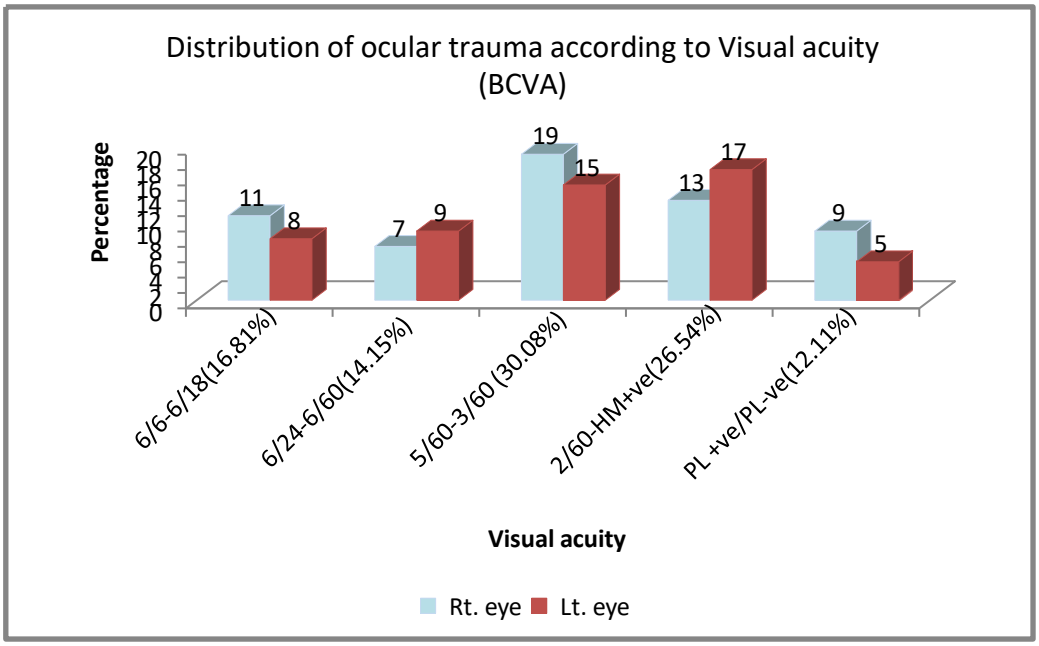


Fig.3- Distribution of ocular trauma according to Visual acuity (BCVA)

The above table is showing highest cases of Corneal laceration seen at13% followed by Iris prolapse 6%, Globe rupture 5%, simple penetration 1%, traumatic cataract+corneal laceration 3% and Intraocular foreign body 1%.

Table.7- Distribution of ocular trauma according to Visual acuity (BCVA)

Visual acuity	Rt. Eye	Lt. eye	Total	%
6/6 – 6/18	11	8	19	16.81
6/24 – 6/60	7	9	16	14.15
5/60 – 3/60	19	15	34	30.08
2/60 - HM+ve	13	17	30	26.54
PL +ve/PL-ve	9	5	14	12.11
Total	**59**	**54**	**113**	**100**

The above table and bar diagram is showing the distribution of ocular trauma according to Visual Acuity. Out of 113 eyes 30.08% had visual acuity 5/60 to 3/60 followed by 2/60 to HM+ (26.54%). 16.81% of cases had 6/6 to 6/18 and 14.15% cases had 6/24 to 6/60 visual acuity. The lowest number of cases (12.11%) was found with visual acuity PL+ to PL-ve.

Table 6. Distribution of Patient according to Intervention Performed

Category	Right eye	Left eye	Total	Percentage
Lid Repair	8	5	13	13
Corneal repair	6	7	13	13

Corneal repair + iridectomy+ cataract extraction	4	5	9	9
Cataract extraction	6	3	9	9
Conjunctival repair	1	2	3	3
Scleral repair	7	5	12	12
Paracentesis	3	5	8	8
IOFB	1	0	0	1
Medical management	17	15	32	33

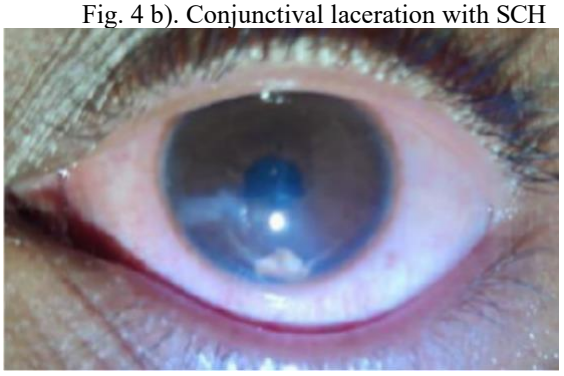
The above table is showing distribution of type of management of ocular trauma. Lid repair was done in 13% cases, corneal repair in 13%, Cataract extraction in 9%, conjunctival repair 3%, scleral repair 12%, Paracentesis of hyphaema in 3% and in IOFB removal in 1%. Medical management was done in 33% cases.

Some clinical photographs of ocular trauma

Fig.4 a). Lid laceration

Fig. 4 b). Conjunctival laceration with SCH

Fig 4. c) Lid ecchymosis



4. d) Foreign body in anterior chamber

Fig. 4. e) Corneal laceration with iris prolapse

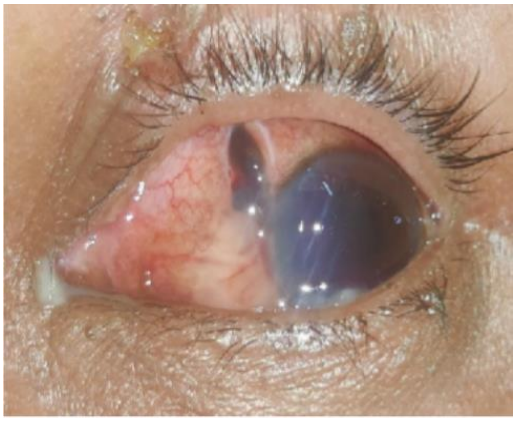


Fig. 4. f) Globe rupture

Discussion

Ocular trauma has severe consequences, not only resulting in significant visual loss and permanent visual disability but also affecting on economy of the family. Despite ocular trauma is being preventable, a significant number of blindness reported globally every year. There is lack of sufficient comprehensive data on magnitude and risk factors of ocular trauma in region wise. Ocular trauma depends upon the occupation, type of works, working habits, availability of safety measures during work and lack of awareness. Type of cultivation and processes of cultivation are different in different region. The Place of this study is geographically located near rural area where the population are mostly engaged with paddy cultivation and tea plantation. This study is designed to enumerate the various causes of ocular trauma and its classification. Visual acuity at the time of presentation and type of management were also recorded.

The demographic breakdown revealed a significant gender disparity. In this study males accounting for 77% (n=77) and females 23% (n=23), resulting in a male-to-female ratio of 3.4:1. **Kanoje et al.** conducted a study in 2024 where 77.47% ocular trauma were male.[6] **Prakash et al** (2013)[7] also conducted a study on ocular trauma where 65.50% were male. In different study of ocular trauma as well as in the present study it is observed that occurrence of ocular trauma is more in male than female. Ocular trauma is higher preponderance in young male. Young male particularly susceptible due to increased exposure to risk factors like sports, violence and occupational hazards. Ocular trauma common in male in all age group because of their outdoor nature of work, such as being drivers, farmers, factory workers and other machinery works.[8] The present studied area is mainly surrounded by tea plantation and paddy cultivation where majority of the male workers are engaged. It has also been observed that in case of machinery works, drivers, outdoor games, burning of fire crackers and in other outdoor works male members are mostly engaged. These are the causes of higher number of ocular traumas among male than female. The higher risk in male has been found in almost every population and hospital-based study of ocular injury

The age and gender pattern were observed in this study. It was found maximum number of cases (29%) were in the age group of 20-29 years followed by 26% in the age group of 30- 39 years. There is a similarity with the study done by **He Cao et al.**[9] That study revealed mean and standard deviation of age of incident as 29±16.8; and a higher male affliction rate. Approximately 3/4th of the sample population was 30 years or younger. Similar results was quoted by **Banerjee et al**.[10].

Additionally, the injury distribution was unevenly split between the unilateral 87% (46 cases was involved Right eye and 41 cases was involved left eye) and bilateral 13%. **Shailaja Karve et al** [11] conducted a study on 2017 where found that most of the patients had involved one eye, right eye being involved 49%, left eye being involved 49.25% cases and both eyes were involved 1.75% cases. In different studies as well as in the present study it has been observed both the eye are almost equally involved.

As per Ocular trauma classification, Birmingham Eye Trauma Terminology (BETT) it has been observed that Closed globe injury is higher than the open globe injury. In is study 71% cases presented with closed globe injuries and 29% cases presented with open globe injuries. A study conducted by Shukla et al [3] (2005) where mentioned that 66.7% was closed globe injury whereas 26.7% was open globe injury. Similar finding in a study on ocular trauma by Woo JH et al [12] (2018) in Singapore were found 95% close globe injuries and 5% open globe injuries. In different studies it has been quoted that close globe injury is higher than open globe injury.

The most frequent causes ocular trauma are road traffic accident and industrial injury and both the causes accounting for same percentage (22%), followed by agricultural injury that was responsible for 21%. Fire related injury mainly fire crackers injury, accounting for 14% cases. Other causes of ocular trauma were sports related injury (6%). physical assault (11%) and animal injury (3%). Road traffic accident was the common cause of avoidable ocular trauma as per report of **Shetgar AC et al. [13] Govind Singh Tityal et al** (2023)[14] in their study reported road traffic accident to be main cause of ocular trauma. This can be explained by heavy increase road traffic in recent years and lack of safety measures and awareness. Same percentage (22%) of Ocular trauma has been observed due to Mechanical cause. Many of the workers are related to tea factory from where ocular injuries reported. Agricultural injury (21%) and 6% chemical injury has also been observed in the present study. A study conducted by **S. Khatry et al [15]** reported that 25.8% cases were due to agricultural agents and 1.30% cases reported chemical injury. There is an another study by **Avinash Misra et al** (2014)[16] who mentioned that 20% road traffic accident, 43.63% Agricultural and 37.01% other causes of ocular trauma. **Singh D.V.** had mentioned 5% cases of chemical injuries in his study.[17] The workers related to tea plantation and paddy cultivation were presented with ocular trauma. Most of ocular burn injury (14%) were mainly related to fire cracker injury during Diwali festival. Sports related equipment and during playing some ocular injuries (3%) were reported in this study. These are the avoidable causes of ocular trauma. Sports related injury as well as fire cracker injury can be prevented by adequate safety measures and awareness. Physical assault is another cause of blunt ocular trauma (11%). **Shailaja Karve et al** found 3% cases of ocular trauma were due to animal injury.[11] In this study the animal parts like horn, tail etc. were caused 3% ocular injuries.

Govind Singh Tityal et al (2013) [14] conducted a study on ocular trauma where observed 77.30% cases closed globe injury and 31.90% open globe injuries. **D N Prakash et al** [7] was found the most common diagnosis at the presentation was closed globe injury (50.01%). In this study 71% ocular trauma were presented with close globe injury and 29% ocular trauma cases were open globe injury. 17% patients presented with lid ecchymosis closely followed by lid laceration i.e. 15%. Subconjunctival hemorrhage with conjunctival laceration was seen in 12% cases. Others causes were Hyphaema 7% Traumatic cataract 7%, Vitreous haemorrhage 5% and Retinal detachment 1%. In a study done by **Wagh** where majority of the patients had lid laceration 67%. [18] **Kyriakaki ED et al** (2021) [19] in their systemic review of study found incidence of closed globe injury to be higher than other ocular injury. Close globe injuries are particularly due to blunt trauma. Hyphaema, traumatic cataract. subconjunctival haemorrhage, Vitreous haemorrhage were the common close globe injury.

Open Globe Injury is the full thickness lacerating injury of the eyeball that are caused by external trauma, usually by a sharp object. Open globe injuries are further subdivided into penetrating, perforating and intraocular foreign body trauma.[20] **Avinash Misra et al (2014)**[16] noted 40.63% penetrating injuries and 3.92% perforating injuries. In this study 29% cases presented with open globe injury. Corneal laceration (13%) is higher than the other open globe injuries followed by Iris prolapses (6%), Globe rupture (5%), simple penetration (1%), traumatic cataract+corneal laceration (3%) and Intraocular foreign body (1%).

In this study large number of cases (30.08%) had visual acuity 5/60 to 3/60 followed by 2/60 to HM+ (26.54%) at the time of presentation. 16.81% of cases had visual acuity 6/6 to 6/18 and 14.15% cases had visual acuity 6/24 to 6/60. The lowest number of cases (12.11%) have been found with visual acuity PL+ to PL-ve. It was observed that many cases presented with visual impairment and blindness. So, ocular trauma is a significant risk factor of ocular morbidity.

Any type of ocular trauma needs to start treatment as earliest. Primary repair in open globe injury should be done within 24 hours of injury. The mechanism and extent of initial injury and findings at presentation are the essential predictors of outcomes of ocular trauma. In the present study surgically managed by Lid Repair 13%, Corneal repair 13%, Cataract extraction 9%, Conjunctival repair 3%, scleral repair 12%, Paracentesis of hyphaema 8% and IOFB removal 1%. Medical management of ocular trauma was done 33% cases.

The primary limitation of this study is lack of population-based data in a particular region and occupation which hinders precise measurement of ocular trauma incidence and prevalence. To make awareness of prevention strategies, a robust and standardized eye trauma surveillance system should be established within a defined population.

Conclusion

Road traffic accidents were the common cause of avoidable ocular morbidity and vision loss in this study as well as other relevant studies. In this study it was found that in this region agricultural injury and mechanical injury were common cause of ocular trauma. Dibrugarh, Assam is surrounded by Tea gardens where thousands of workers are engaged and cultivation is the primary occupation of rural population. Moreover, it was found Closed globe injury predominate and visual prognosis is generally better than open globe injury. Ocular trauma can be prevented by mass awareness regarding potential risk factors and agents responsible for ocular injuries and by adequate safety measures.

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