Original Article

Clinical study of ocular trauma with special reference to ocular trauma score

Supriya Patil[1*], V H Karambelkar[2], D K Sindal[3], Bhalchandra Joshi[4], Gaurav Paranjpe[5]

[1]Resident, [2]Professor, [3]Professor and HOD, [4]Associate Professor, [5]Assistant Professor, Department of Ophthalmology, KIMSDU, Malkapur, Karad, Maharashtra, INDIA.
Email: suyodhanghorpade@gmail.com

Abstract
Introduction: "Vision" is the most prestigious gift given by God and is the most cared for function of the human, so if it gets injured the damage is much more disabling than any other organ. **Aim and objective:** To assess the visual outcome with the help of ocular trauma score following primary management (Medical and /or surgical repair) of ocular Injury. Methodology: hospital based prospective interventional case study of 100 patients presenting with ocular to ophthalmology and neurosurgery department of tertiary health care hospital .Preoperative factors affecting final visual outcome in patients and correlation of OTS of present study with OTS of USEIR is performed. **Results and observations:** out of 100 patients,80% had mechanical injury and 20% had chemical injury. Males were predominantly affected 74%.Majority of patients had RTA 24%, Agricultural 23%followed by Industrial, Domestic, Sports and Firecracker in 19%,13%,11%,10% respectively. **Discussion:** Patient with low OTS had higher risk of poor visual acuity as against patient with high OTS had better final visual acuity.
Keywords: Ocular trauma score, oculartrauma, relative afferent pupillary defect, united state eye injury registry.

Access this article online	
Quick Response Code:	**Website:** www.medpulse.in
	DOI: 16 December 2016

INTRODUCTION

"Vision" is the most prestigious gift given by God and is the most cared for function of the human. Though naturally eyeball is a fairly well protected structure in our body, if it gets injured the damage is much more disabling than any other organ. Despite protective mechanisms, injuries to the eye are commonly found and is the commonest cause of attendance for ophthalmic emergency. The effects of ocular injuries are much more severe because of the delicacy of the ocular tissue resulting in permanent blindness. Therefore, they assume unusual social and economic importance, involving a huge cost in human unhappiness and economic inefficiency[1]. The incidence of ocular trauma may be higher in developing countries due to less stringent laws relating to childcare. Many of Injuries in children can be prevented by parental supervision, awareness of child activities and use of proper protective measures[2]. In developing countries like, India activities such as agriculture, carpentry, chiseling and hammering are responsible for many eye injuries .There is an urgent need to step up the safety precaution to prevent such disabling eye injuries. Improved machines, provision of adequate illumination of work, selection of trained workers with adequate vision and alertness, periodic testing for alcohol and finally making use of eye protection mandatory are some of steps that can be taken towards this goal. Penetrating Injuries to uveal tissue (iris, ciliary body and choroid) induces an inflammation (uveitis) which excites a similar destructive inflammation in the uvea of uninjured eye (sympathetic ophthalmitis). Thus an injury to one eye can result in total blindness[3]. It is an honest attempt made to evaluate the visual outcome after six months follow up with the help of ocular trauma score following primary management.

MATERIAL AND METHOD

The present hospital based prospective study was undertaken to evaluate ocular trauma clinically with special reference to ocular trauma score. A total of 100 patients presenting with ocular trauma visiting ophthalmology and neurosurgery department of tertiary health care hospital during study period of Nov. 2014 To May 2016 were included in the study. The patients with ocular injury were included in the study with proper consent. The patients with history of intraocular surgery of the injured eye, eyes with previously impaired vision, unconscious patients and trauma in newborn and children less than 5 years old were excluded from the study. At the time of presentation a detailed history of each patient was recorded. A complete general and ophthalmic evaluation of the patient, including testing the presenting visual acuity and pupillary reactions, slit-lamp examination of the anterior segment and fundoscopy, was done wherever possible. All patients undergo primary repair of the open-globe injury, performed by an experienced surgeon. A written informed consent was taken from each patient prior to the surgery. Patients were followed up as required depending on type of injury and final vision assessed at six months follow up. The results obtained were analysed using appropriate statistical methods.

How to calculate the ocular trauma score

First, determine the patient's initial visual acuity after the injury and their tissue diagnoses. Second, assign a raw point value for initial visual acuity from row A from Table 1. Then subtract the appropriate raw points for each diagnosis from rows B-F. (For example, a patient with an initial visual acuity of CF at 6-inch, scleral rupture and retinal detachment would receive a raw OTS score of 80-23-11 = 46). Higher OTS scores tend to indicate a better prognosis. To provide an estimate of the patient's probability of attaining a specific visual acuity range at six-month follow-up. locate the raw score in Table 2 corresponding to the patient's OTS. Table 2 Shows the estimated probability of all potential visual out comes vision after six-months[4].

OBSERVATION AND RESULTS

Table 1: Computational method for deriving the OTS score

Initial Visual Factor	Raw Points		
	NLP'	=	60
	LP to HM	=	70
A. Initial Visual Acuity Category	CF 6 INCH to 6 M	=	80
	6/60 to 6/18	=	90
	> 6/12	=	100
B. Globe rupture	-23		
C. Endophthalmitis	-17		
D. Perforating Injury	-14		
E. Retinal detachment	-11		
F. Afferent pupilary defect	-10		
Raw score sum = sum of raw points			

Table 2: Estimated probability of follow-up visual acuity category by the OTS score

Raw Score Sum	OTS Score	NLP	LP/HM	CF 6' to 6M	6/60 To 6/18	> 6/12
0-44	1	73%	17%	7%	2%	1%
45-65	2	28%	26%	18%	23%	15%
66-80	3	2%	11%	15%	28%	44%
81-91	4	1%	2%	2%	21%	74%
92-100	5	0%	1%	2%	5%	92%

Table 3: Distribution according to age and sex

AGE	MALE	MALE (%)	FEMALE	FEMALE (%)	TOTAL	AGE (%)
5-10	6	8.11%	3	11.54%	9	9%
11-20	8	10.81%	3	11.54%	11	11%
21-30	20	27.03%	8	30.77%	28	28%
31-40	15	20.27%	6	23.08%	21	21%
>40	25	33.78%	6	23.08%	31	31%
Total	74	100%	26	100%	100	100%

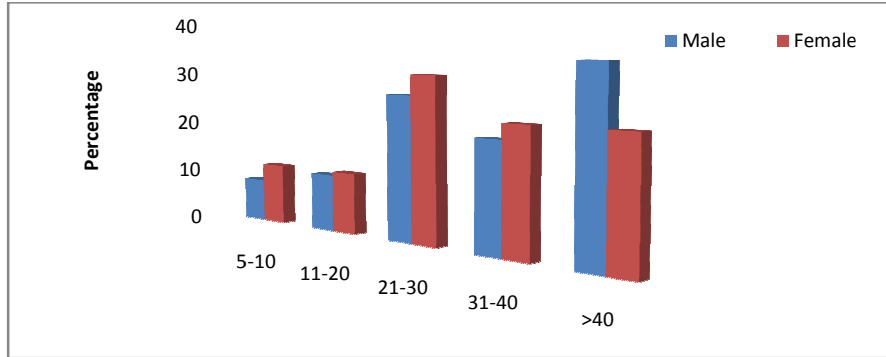Supriya Patil, V H Karambelkar, D K Sindal, Bhalchandra Joshi, Gaurav Paranjpe

Figure 1: Bar diagram showing distribution according to age and sex

The majority of patients were in age group >40 years (31%) followed by age group 21-30 years. (28%) The majority of male patients were in age group >40 years (33.78%) while female were in age group 21-30 years (30.77%).
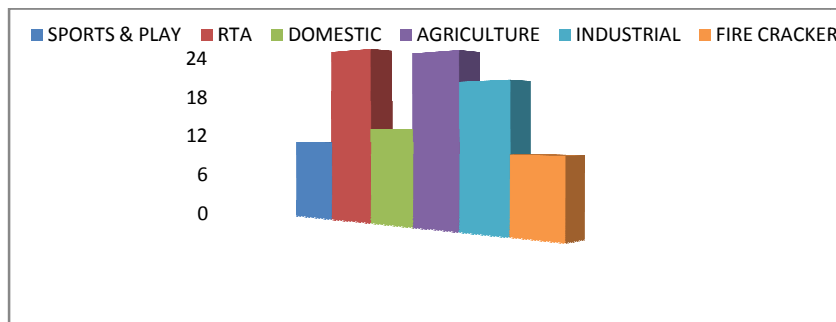

Figure 2: Bar diagram showing distribution according to type of injury to eye

Among 100 patients; majority of patients had road traffic accident (24%) followed by agriculture work (23%). The industrial, domestic, sports and fire cracker injury was seen in 19%, 13%, 11% and 10% respectively.
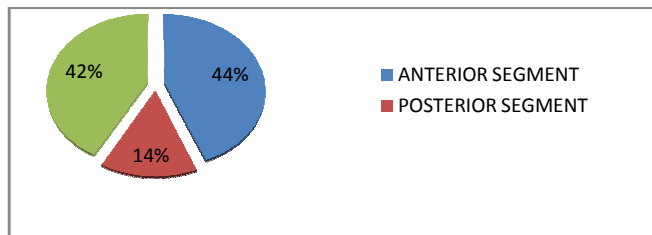

Figure 3: Pie chart showing distribution according to ocular damage to eye

Out of 100 patients, anterior segment was damaged in 44%, posterior segment damaged in 14% and both segments were damaged in 42% of patients.
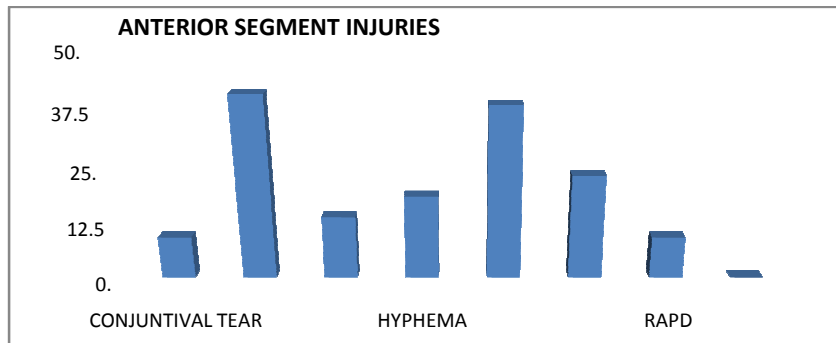

Figure 4: Bar diagram showing distribution according to anterior segment injuries to eye

Majority of patients had corneal abrasion (40.69%) followed by iris involvement (38.37%). The lens involvement and hyphema was seen in 23.26% and 18.61% respectively.
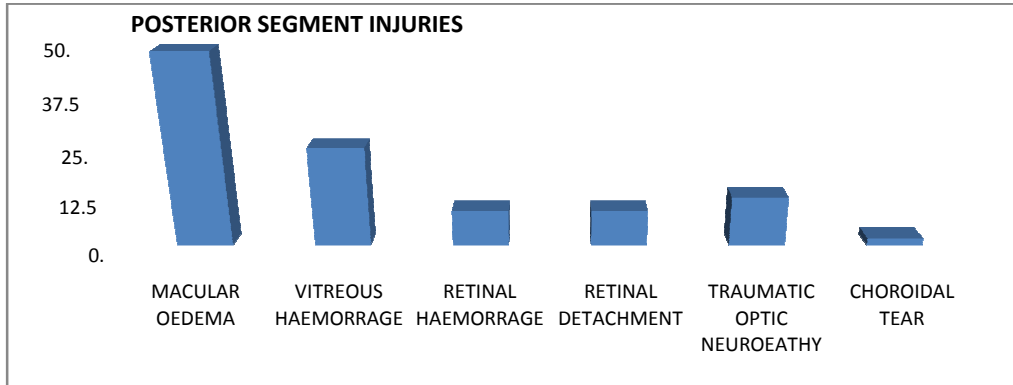
Figure 5: Bar diagram showing distribution according to posterior segment injuries to eye

Majority of patients had macular oedema (48.21%) followed by vitreous haemorrhage (25%). Retinal detachment and Retinal Haemorrhage was seen in 8.93%.
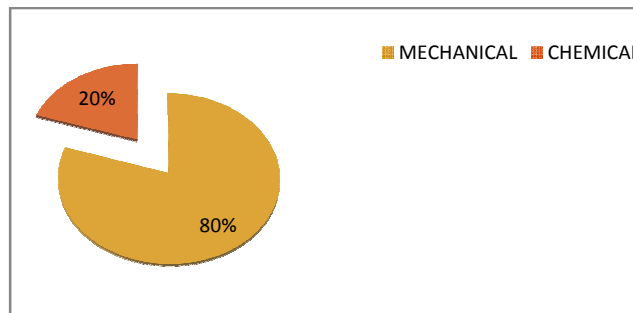

Figure 6: Pie chart showing distribution according to type of injury to eye

Out of 100 patients 80% had mechanical injury and 20% had chemical injury.
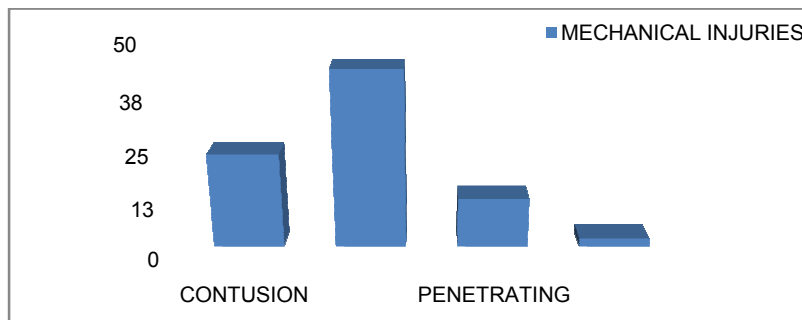

Figure 7: Bar diagram showing distribution according to mechanical injuries to eye

Majority of patients had blunt injuries like laceration (53.75%) followed by contusion (28.75%). The penetrating and perforating injuries were seen in 15% and 2.5% respectively.

Table 4: Relation of age and vision after 6 months of injury to eye

AGE IN YEARS	VISION AFTER 6 MONTHS OF INJURY					
	NO PL	PL TO HM	CF TO 6 M	6/60 TO 6/18	> 6/12	TOTAL
5-10	0	2	0	2	5	9
11-20	1	0	1	1	8	11
21-30	1	1	2	5	19	28
31-40	1	0	1	3	16	21
>40	1	2	2	9	17	31
TOTAL	4	5	6	20	65	100

It was observed that with increasing age the vision of eye did not come to normal vision with statistical significance. (P<0.05).
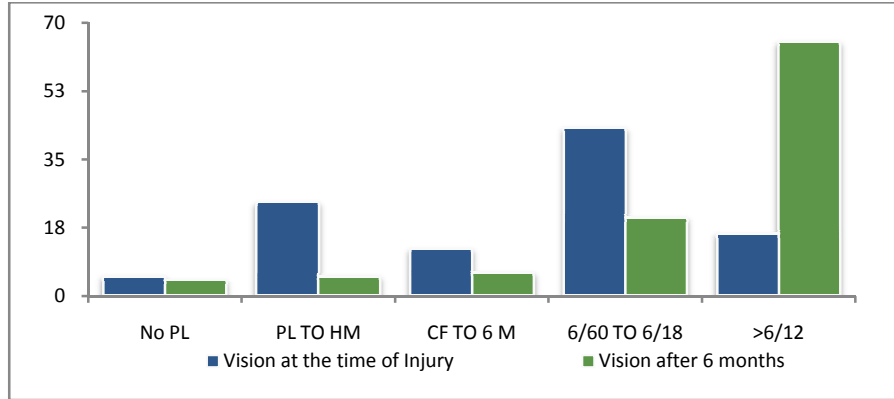
Figure 8: Bar diagram showing comparison of Vision at the time of injury and after 6 months

Table 5: Comparison of probability of follow-up visual acuity category after 6 months in present OTS study and the USEIR OTS study

| RAW SCORE | OTS SCORE | OTS | | | | | |
		NLP	LP TO HM	CF 6 TO 6 M	6/60 TO 6/18	>6/12	Total
0-44	PRESENT STUDY	4 (100)	0 (00)	0 (00)	0	0	4 (100)
	USEIR STUDY	73%	17%	7%	2%	1%	100%
45-65	PRESENT STUDY	0	5 (35.71)	4 (28.58)	5 (35.71)	0	14 (100)
	USEIR STUDY	28%	26%	18%	13%	15%	100%
66-80	PRESENT STUDY	0	0	2 (8.33)	12 (50)	10 (41.67)	24 (100)
	USEIR STUDY	2%	11%	15%	28%	44%	100%
81-91	PRESENT STUDY	0	0	0	3 (7.14)	39 (92.86)	42 (100)
	USEIR STUDY	1%	2%	2%	21%	74%	100%
92-100	PRESENT STUDY	0	0	0	0	16 (100)	16 (100)
	USEIR STUDY	0%	1%	2%	5%	92%	100%

It was observed that positive correlation between present OTS study and normal visual acuity with statistical significance. ($P<0.05$).
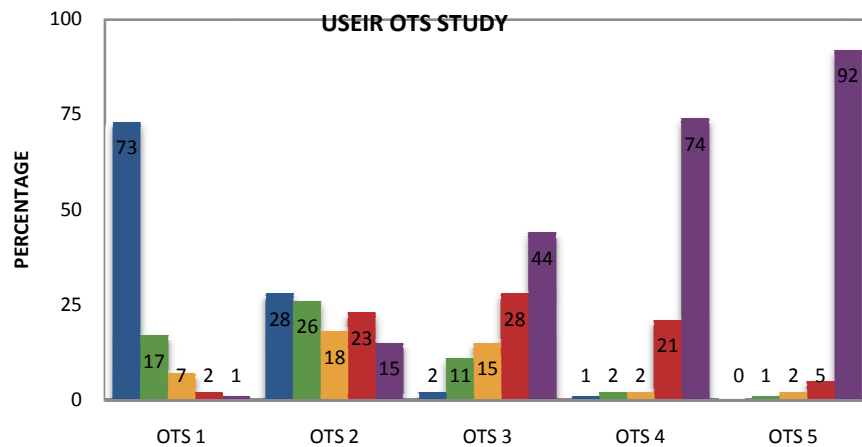

Figure 9: Bar diagram showing probability of follow-up visual acuity after 6 months in USEIR OTS study
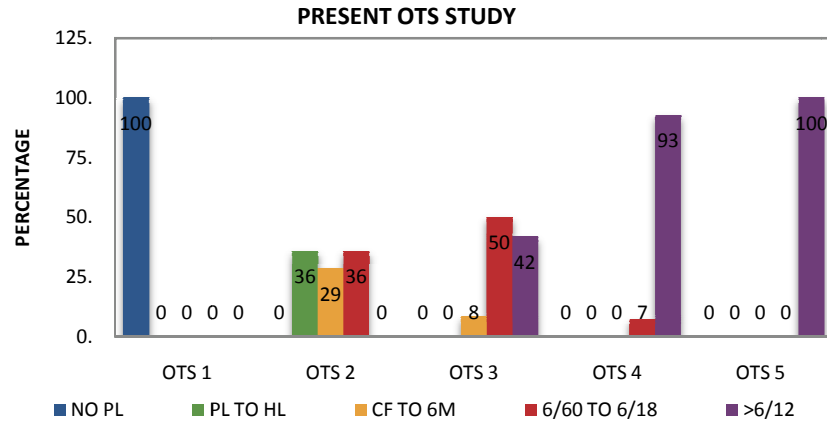
Figure 10: Bar diagram showing probability of follow-up visual acuity after 6 months in PRESENT OTS STUDY

DISCUSSION

In the present study the distribution of patients according to various age groups and sex showed that the majority of patients were in age group >40 years (31%) followed by age group 21-30 years. (28%) The majority of male patients were in age group >40 years (33.78%) while female were in age group 21-30 years (30.77%). The mean age of the patients in the study was 32.84 ±12.36 years. Similar findings were seen in study done by Yu Meng and Hua Yan[5] on prognostic factors for open globe injuries and correlation of ocular trauma score in Tianjin, China observed that among 298 patients with open globe injuries were analysed the mean age was 45.46 ±17.48 years (5–95 years). In the study done by Govind Singh Titiyal et al[6] where out of the studied 165 cases, 93 patients were below 30 years of age. The distribution of patients according to their sex and respective percentage showed that of 100 patients 74% were males and 26% females. Similar findings were seen in study done by Yu Meng and Hua Yan on prognostic factors for open globe injuries observed that among 298 patients with open globe injuries males had a higher rate of open globe injury than females (83.56% versus 16.44%). In the study done by Govind Singh Titiyal et al where out of the studied 165 cases, majority of patients were male with Male: Female ratio was 10:1. In the present study, among 100 patients; majority of patients had road traffic accident (24%) followed by agriculture work (23%). The industrial, domestic, sports and fire cracker injury was seen in 19%, 13%, 11% and 10% respectively. In the study done by Govind Singh Titiyal et al where among the causes of injury, road traffic accidents accounted for maximum number of cases, i.e., 54 (32.7%), followed by sports, playing and recreational activities which accounted for 42 (25.5%) patients and occupation related 33(20%) and others like domestic accidents, violence related were other identified causes. The distribution of patients according to ocular damage to eye showed that out of 100 patients, anterior segment was damaged in 44%, posterior segment damaged in 14% and both segments were damaged in 42% of patients. It was observed that majority of patients had corneal abrasion (40.69%) followed by iris involvement (38.37%). The lens involvement and hyphema was seen in 23.26% and 18.61% respectively. In the study done by Shobha G Pai et al[7] on clinical study of blunt ocular trauma in a tertiary care centre observed that anterior chamber was involved in 18.75%. The cornea was involved in 37.5%, iris in 15.62% while lens was involved in 9.37%. The posterior segment injuries to eye showed that majority of patients had macular oedema (48.21%) followed by vitreous haemorrhage (25%). Both the retinal haemorrhage and retinal detachment was seen in 8.93% patients. In the study done by Shobha G Pai et al on clinical study of blunt ocular trauma in a tertiary care centre observed that posterior chamber was involved in 9.37%. The vitreous haemorrhage was present in one patient only. The distribution of patients according to type of injury showed that out of 100 patients 80% had mechanical injury and 20% had chemical injury. It was observed that majority of patients had blunt injuries like laceration (53.75%) followed by contusion (28.75%). The penetrating and perforating injuries were seen in 15% and 2.5% respectively. In study done by Yu Meng and Hua Yan regarding type of injury, penetrating injury (61.15%) accounted for the majority of open globe injuries, followed by intraocular foreign body (26.43%). Rupture (17, 5.41%) and perforating injury (22, 7.01%) accounted for the remaining open globe injuries. The relation between age and vision at time of injury to eye was described in table above. It was observed that increasing age and vision shows a negative correlation with statistical significance. (P<0.05). The relation between age and vision after 6 months of injury to eye was described in table above. It was observed that with increasing age the vision of eye did not come to normal

vision with statistical significance. (P<0.05). The relation between OTS and vision after 6 months was described in table above. It was observed that with positive correlation between OTS and normal visual acuity with statistical significance. (P<0.05). OTS study stated that a patient with OTS category one will have a higher risk of poorer final VA as against a patient with OTS category five who will have a higher probability of better final VA[8]. In study done by Yu Meng and Hua Yan found that only 16.98% of patients with OTS category one had final VA of 20/200 or better, whereas 30.19% of patients with OTS category one had final VA of NLP. Of the patients with OTS category five, 100% had final VA of 20/40 or better. Another study by Man and Steel[9] also suggested that OTS possibly had predictive value of the final VA in open globe injury. OTS is of great importance for patients and ophthalmologists. Schmidt et al.[10] have demonstrated that initial VA was found to correlate significantly with the final VA in open globe injuries. In study by Yu Meng and Hua Yan showed similar results that patients who had initial VA of 20/200 or better had improvement in final VA; however, majority of patients with initial VA of LP/HM or worse had poor final VA. Based on multivariate logistic regression analysis, initial VA had statistically significant influence on the final VA ($p< 0.001$). In study done by He Cao et al[11] open-globe injuries exhibited poorer visual prognoses than closed-globe injuries. The most common open globe injuries were anterior penetrating injuries and were associated with good visual prognosis, whereas open injuries that involved the posterior globe often accompanied retinal detachment, severe vitreous haemorrhage or endophthalmitis which are associated with poor prognoses.

CONCLUSION

OTS, a very comprehensive score to predict final VA in patients with ocular trauma injuries, should be more commonly used by ophthalmologists of the world. This study has shown that road traffic accidents are the commonest causes of ocular injuries followed by occupational accidents. Thus it is recommended preventive measures advocated by health workers to emphasise the importance of early health seeking behaviour and follow up of patients with ocular trauma. Simple safety procedures like wearing seat belts in

driving, protective goggles in welding, supervising children while playing, etc. should be advocated using mass media. Ocular trauma adds to the social, emotional, and psychological impact on the overall development of an individual. So the targeting group most at risk should be provided with effective eye protection, should develop safety cultures, and should be given health education regarding eye protection to reduce the eye injuries and thus decrease the magnitude of the blindness.

REFERANCES

1. SIR Stewart Duke- Elder, The nature and incidence of ocular injuries, System of ophthalmology Volume XIV. Injuries part-1 .Mechanical injuries,1972,p4
2. NegrelAD,Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiology.1985:5(3): 143-69.
3. SIR Stewart Duke- Elder,Perforating injury, , System of ophthalmology Volume XIV. Injuries part-1 .Mechanical injuries,1972,p411
4. Kuhn F, Moris P, Mester V, Witherspoon CD, Mann L. Predicting the severity of eye injury: the ocular trauma score [OTS]. In KunF,ed. 1st ed. Ocular Traumatology.Berlin: Springer- Verlag, 2008,p17-22.
5. Yu Menhand Hua Yan. Prognostic factors for Open globe injuries and correlation of ocular trauma score in Tianjin, China. Journal Of ophthalmology.2015, Article ID 345764: 1-6.
6. Govind Singh Titiyal, Chandra Prakash, Swati Gupta, Vijay Joshi,. Pattern of Ocular trauma in tertiary care hospital of Kumaon Region, Uttaraj=khand. J. Indian Acad Forensic Med. 2013;(35) :2116-119
7. Shobha G Pai, Sumana J Kamath, Susan D'souzaandLaksheyDudeja. A clinical Stud of Blunt Ocular trauma in a tertiary care centre. Online journal of health and Allied Sciences.2013; Vol 12, Issue 2;1-3.
8. F.Kuhn ,R. Maisiak, L.Mann, V.Mester,R.Morrisand C.D. Witherspoon, " The ocular trauma score (OTS)." Ophthalmolgy Clinics of North America, 2002; vol 15, No 2: 163-165.
9. C.Y.W Man and D. Steel, "Visual outcome after open globe injury: a comparison of two prognostic models – The Ocular trauma score and the classification and Regression tree," Eye. 2010; Vol 24, No 1: 84-89.
10. G.W. Schmidt, A.T.Broman, H.B.Hindman, andM.P.Grant, "Vision survival after open globe injury predicted by classification and regression tree analysis" Ophthalmology .2008; Vol. 115, No.1: 202-209.
11. Cao H, Li L, Zhang M. Epidemiology Of patients hospitalized for ocular trauma in the Chaoshan Region of China,2001-2010.2012;PLoS ONE7(10):e48377.

Source of Support: None Declared
Conflict of Interest: None Declared