BACKGROUND
Ocular trauma is an important worldwide cause of visual morbidity. It includes a spectrum of simple ocular surface foreign bodies, minute corneal abrasions to devastating perforating injuries causing blindness. Children are particularly susceptible to ocular trauma. Identification of the cause of injuries among children may help in determining the most effective measures to prevent visual loss. The purpose of this study is to analyse visual status at the time of presentation and to find the time gap between the occurrence of trauma and presentation, intervention and visual outcome in paediatric ocular trauma at Regional Institute of Ophthalmology, Kolkata, West Bengal.

MATERIALS AND METHODS
A total of 100 children (age 0-14 yrs.) who attended outpatient department and emergency of Regional Institute of Ophthalmology and got admitted were included in the study. Detailed history regarding mode of injury, type of injury, time of injury and time elapsed to attend the hospital from the onset of injury noted. Recording of visual acuity and detailed clinical examination done. Appropriate medical and surgical treatment given as per the standard protocol after assessing the type of injury. Visual outcome assessed by doing follow up at presentation at 1 month and 6 month after injury.

RESULTS
Our study showed that 37% of the children who presented to us had visual acuity between 2/60 and Perception of light (PL) positive. 7% had vision between 6/6 and 6/12. PL was denied in 5% patients. Majority (44%) of the children who suffered ocular trauma presented to our hospital between 25-48 hrs. of injury. 88 out 100 patients who were hospitalised were operated within the first 24 hours. At one month after injury, 28% had visual acuity between 6/60 and 3/60 and six months after injury, 25% had visual acuity between 6/18 and 6/36.

CONCLUSION
Close supervision at home, school and playground, public awareness and education regarding the hazardous nature of firecrackers and road safety measures are critical to prevent the traumatic visual loss in children. Delay in presentation of children to the hospital may lead to substantial damage to the ocular structures during these initial crucial hours.

KEYWORDS
Paediatric Ocular Trauma, Type of Injury, Visual Acuity at Presentation, Traumatic Visual Loss.

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BACKGROUND
Worldwide ocular trauma is an important cause of visual morbidity. It includes a spectrum of simple ocular surface foreign bodies, minute corneal abrasions to devastating perforating injuries causing blindness. Children are particularly susceptible to ocular trauma; 52% of all ocular trauma affects paediatric patients and trauma is the leading cause of monocular blindness in children. Children younger than 5 years seem to be more affected, although other series indicate ages between 11-15 years with a male preponderance are at higher risk due to sport-related trauma particularly in economically-developed countries. In developing countries like India, domestic activities have a more significant role in occurrence of injury.

Injuries with sticks, stones, cricket ball and metallic objects are most common. Ocular injuries occur in three forms- open globe injury, closed globe injury and adnexal injuries. Open globe injuries are one of the most common emergencies in ophthalmology clinics and require immediate operation. Identification of the cause of injuries among children may help in determining the most effective measures to prevent visual loss. Work-related accidents are fairly common in developing countries where children work.
at a younger age or are bystanders. Paediatric ocular trauma has a significant impact on the future quality of life as children are exposed to a major risk of amblyopia.

The ocular trauma classification group has developed a classification system based on BETTI and features of globe injury at initial examination (Birmingham Eye Trauma Terminology System). A visual acuity should be attempted and documented if the child is verbal and conscious. Presence/absence of a Relative Afferent Pupillary Defect (RAPD) is a very important neuro-ophthalmological sign. If the globe or eyelids are suspected to be lacerated, a shield should be placed on the eye, the patient should be kept nothing per mouth. Appropriate radiological studies should be obtained if orbital fracture, intraocular or intraorbital injury is suspected. Chang and Rubin present a very thorough review of eyelid laceration injury and the proper approach to repair. Orbital bony fractures are one of the more commonly encountered findings in children who suffer head and face trauma. Grant et al and Egbert et al demonstrate that most of the orbital floor fractures in children are of the trapdoor type. Studies in the review period recommend surgical intervention within 5-7 days after the injury in children versus 2 weeks or longer in adults.

Among paediatric ocular perforating injury, the most common manifestation was corneal tear. C G Thompson Kumar, F A Billson and F Martin showed that the commonest causes of perforating ocular injury were sharp tools (knives/scissors) poked by the child into his/her own eye. Fireworks are responsible for 4.4% of all injuries and 80% of these are caused by bottle rockets. Cranial nerve palsies, including third, fourth and sixth nerves are often found in conjunction with ocular and head trauma in children. The purpose of this study is to analyse visual status at the time of presentation and to find the time gap between trauma and presentation, intervention and visual outcome in paediatric ocular trauma at Regional Institute of Ophthalmology, Kolkata, West Bengal.

MATERIALS AND METHODS
A total of 100 children (age 0-14 yrs.) attending Outpatient Department and Emergency of Regional Institute of Ophthalmology and got admitted were included in the study. Detailed history regarding type of injury (open or closed type), time of injury and time elapsed to attend the hospital from the onset of injury noted. Enquiry made about immunisation status, treatment received prior to arrival at our centre and time of last feeding. History of previous ocular surgeries, previous ocular injuries and the visual acuity of both eyes prior to injury and the history of systemic conditions like bleeding disorders were noted from the point of view of surgery and the visual rehabilitation of the child.

Visual status recorded with a Snellen acuity chart or a Rosenbaum near card. Detailed clinical examination using standard clinical and investigational procedure done. Closed globe injuries are divided into following zones. Zone I injuries include superficial injuries of the bulbar conjunctiva, sclera or cornea. Zone II injuries encompass damage to the lens apparatus or structures of the anterior segment. Zone III injuries include damage to the retina, vitreous, posterior uvea (ciliary body, choroid) and optic nerve. Pupillary reaction noted. Injuries due to chemical, electrical or thermal agents were not included in this study. Visual acuity at presentation time before surgical intervention if any and visual acuity at 1 week, 1 month, 3 months and 6 months of injury noted.

Inclusion Criteria
1. Children (0-14 years) who attend Regional Institute of Ophthalmology emergency or outpatient department with a history of trauma and required hospitalisation.
2. Informed consent by the guardian.

Exclusion Criteria
1. Children with history of any pre-existing diseases like congenital anomalies, glaucoma or any other non-traumatic cause.
2. Injuries caused by thermal, electrical and chemical agents.

Followup
In the follow up visits, we assessed the visual acuity. Refraction under cycloplegia was done for all children. Examination of anterior and posterior segment was done. We looked for the complications that can occur with passage of time like cataract, angle recession glaucoma, retinal detachment and amblyopia.

RESULTS AND ANALYSIS
This is institution-based cross-sectional study over 100 children (age 0-14 yrs.) who attended outpatient department and emergency of Regional Institute of Ophthalmology and got admitted. Statistical analysis was performed with help of Epi Info (TM) 3.5.3, which is a trademark of the Centres for Disease Control (CDC). Using this software, basic cross-tabulation and frequency distributions were prepared. $X^2$ test was used to test the association between different study variables under study. Corrected $X^2$ test was used in case of any one of cell frequency was found less than 5 in the bivariate frequency distribution.

The results of the study and the analysis are given below.

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open globe injury</td>
<td>71</td>
<td>71.0</td>
</tr>
<tr>
<td>Closed globe injury</td>
<td>15</td>
<td>15.0</td>
</tr>
<tr>
<td>Adnexal injury</td>
<td>14</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 1. Type of Injury

The injuries were classified as open globe, closed globe and adnexal injuries. 71% of the injuries were open globe followed by closed globe (15%) ($Z=7.99; p<0.001$). Adnexal injuries constituted 14% of the injuries.
The mean (mean ± S.D.) time interval between incidents of injury was 47.26 ± 14.19 hours with range 7-92 hours and the median was 46.89 hours. Majority (44%) of the children who suffered ocular trauma presented to our hospital between 25-48 hrs. of injury, which was significantly higher (Z=2.82; p=0.004), 15% presented between 49-72 hrs. and 16% presented after 72 hrs. Only 25% of the patients presented within the first 24 hrs.

At presentation, 37% of the children had visual acuity between 2/60 and PL positive. In 27% of the children, the visual acuity couldn’t be assessed as many times due to poor cooperation from the younger children. 17% of them had visual acuity between 6/60 and 3/60. 7% of the patients had vision between 6/18 and 6/36. Another 7% had vision between 6/6 and 6/12. PL was denied in 5% patients. Proportion of patients with visual acuity between 2/60 and PL positive. Thus, most of them presented with visual acuity between 2/60 and PL positive, which was significantly higher (Z=3.18; p=0.0014).

At one month after treatment, most of the children (28.0%) had visual acuity between 6/60-3/60 followed by between 2/60 and PL positive (24.0%), which was significantly lower than that of presentation (37.0%) (Z=1.99; p<0.05). 14% and 21.0% of the patients had vision between 6/18-6/36 and between 6/6-6/12 respectively, which were significantly higher than that of presentation (Z=2.85; p<0.01). PL was denied by 8% of the patients and 5% patients were lost to follow up, but it was not significant as compared to presentation and follow up at 1 month (Z=0.86; p>0.05).

At 6 months after treatment, most of the children (25.0%) had visual acuity between 6/18-3/36 followed by 6/6-6/12 (24.0%), which were significantly higher than that of presentation and follow-up at 1 month (Z=1.98; p>0.05). 18.0% and 20.0% of the patients had vision between 6/60 -3/60 and between 2/60 and PL positive respectively, which were significantly lower than that of presentation and follow-up at 1 month (Z=2.66; p<0.01). PL was denied by 8% of the patients and 5% patients were lost to follow up, but it was not significant as compared to presentation and follow up at 1 month (Z=0.86; p>0.05).

Thus, improvement of visual acuity was observed over time.

**DISCUSSION**

Children with immature motor skill and their tendency to imitate adult behaviour without evaluating risks is an important mode of injury (Thordarson pelting, civilian unrest 2010, U. Ragnasson AT et al). Serious ocular trauma gives rise to irrecoverable structural damage or functional loss, which imposes an enduring burden throughout the most productive years of life (Robert JC).

In our study, out of 100 children, 37% of the children who presented to us had visual acuity between 2/60 and PL positive. In 27% of the children, the visual acuity couldn’t be assessed as many times younger children don’t cooperate. 17% had visual acuity between 6/60 and 3/60. 7% of the patients had vision between 6/18 and 6/36. Another 7% had vision between 6/6 and 6/12. PL was denied in 5% patients. A study conducted by Meral Yildiz et al showed that out of the 54 children included in the study, the visual acuity of 23 children (42.6%), could not be measured at presentation. Two children (3.7%) had visual acuity of no light perception and 12 (22.2%) had visual acuity of light perception. Out of the 17 children whose visual acuity could be assessed on Snellen’s chart 5 (9.3%) had vision better than 6/18, 9
Twenty-five (25%) had vision better than or equal to 6/12. 64% had visual acuity better than or equal to 3/60. In 24%, vision was between 2/60 and PL positive. PL was denied in 8% patients and 2% patients were lost to follow up.

Six months after injury, 24% of the children had best corrected visual acuity better than or equal to 6/12. 67% had visual acuity better than or equal to 3/60. 20% had vision between 2/60-PL positive. PL was denied in 8% patients and 3% patients were lost to follow up.

In the study, pattern of paediatric ocular trauma in rural area of Marathwada by Chandrakishor Hemraj Pardhi et al, at the end of 2 months, best corrected visual acuity of more than 6/18 achieved in 62% eyes, 6/18 to 6/60 in 12% eyes, <6/60 to finger counting close to face in 8% eyes, Perception of Light (PL) positive and Projection of Rays (PR) and PL denied in (1%) each eyes. Better visual outcome is achieved in this study and the cause can be the type of injury.

CONCLUSION

The most common aspect of paediatric ocular trauma is prevention. Close supervision at home, school and playground, public awareness and education regarding the hazardous nature of firecrackers and road safety measures are critical to prevent the traumatic visual loss in children. Legislation to ban the use of firecrackers by children would help in saving a lot of eyes. Delay in presentation of children to the hospital may lead to substantial damage to the ocular structures during these initial crucial hours. Improvement of rural health services is needed and it is required to provide them with facilities and equipment, which is necessary for urgent management of ocular trauma.

REFERENCES


