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A RETROSPECTIVE OBSERVATIONAL STUDY TO ASSESS THE CLINICAL, DEMOGRAPHIC PROFILE AND FACTORS ASSOCIATED WITH POOR VISUAL OUTCOME AMONG PATIENTS WITH OCULAR INJURIES ENCOUNTERED WITH FIRECRACKERS.

Ophthalomology

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ABSTRACT

Objective: To evaluate the demographic and clinical profile of ocular injuries encountered with firecrackers and identify various factors leading to poor visual outcome. **Methods:** In this retrospective hospital-based case study, patients presented to our tertiary care hospital with ocular trauma due to firecrackers during 2014-2023 were recruited. Data regarding demographic details, history of injury, visual acuity, details on anterior and posterior segment examination, classification of injury based on Birmingham Eye Trauma Terminology System, management were collected from the medical records. **Results:** 471 eyes of 401 patients were included in the study. 346 were males and 55 females. The median age was 13 years. 52.61%(n=211) were bystanders. 40.6% injuries were caused by bomb firecracker. 7.98% had open globe injuries. 86 eyes (21.44%) had presenting visual acuity ranging from counting fingers close to face to perception of light, and 1.99% (8 eyes) had no perception of light. Most common findings were epidefects (50.87%), superficial corneal foreign bodies (27.68%), anterior uveitis (26.18%) and hyphema (23.94%). 12.21% were operated for corneoscleral tear, conjunctival tear and lid lacerations.20.19% had posterior segment involvement.5 cases had endophthalmitis post trauma. **Conclusion-** Ocular injury due to firecracker can lead to significant vision loss. Open globe injury, poor visual acuity at time of presentation and posterior segment involvement can lead to poor visual outcome. It is important to create awareness, supervise paediatric age group and implement legislative measures to reduce the firecracker eye injuries.

KEYWORDS

ocular injury, firecracker

INTRODUCTION

Firecrackers are known to cause remarkable ocular injuries that can lead to profound blindness. Firecrackers are responsible for an estimated 19% of ocular injuries.[1] They are commonly set off during various celebrations, such as festivals, weddings, birthday parties, and other events. During the use of firecrackers, trauma can occur to the eyes, face, head, hands, and legs. Injury not only occurs to the individual bursting the firecracker but also to the bystanders.[2]

Risk factors for ocular injuries from firecrackers include improper use, lack of knowledge, carelessness, and the use of homemade fireworks. The primary group affected is the paediatric population.

This study aims to assess the various clinical patterns and demographic profile of ocular injuries caused by firecrackers and the management strategies implemented. We also emphasize gathering detailed histories to identify the type of firecracker, the nature of the injuries, and any changes in trends. We have made efforts to identify the factors that contribute to poor final visual outcomes.

MATERIALS AND METHODS

This was a hospital based, single centre, retrospective observational study.10 years medical records of firecracker registry from 2014-2023 of a tertiary care hospital in South India was retrospectively viewed. Ethical clearance was obtained from the Institutional Ethics Committee.

Data regarding the patient demographic details, mode of injury, details on the firecracker, complaints post trauma, injuries elsewhere, were collected.

The patients had been subjected to detailed ocular examination including the anterior and posterior segment evaluation. B scans, gonioscopy and X ray orbit were done when indicated. The ocular injuries were categorized based on Birmingham eye trauma terminology system (BETTS).[3]

The management done depended on severity of the injury and included outpatient treatment with follow up as well as in patient treatment wherever required. Surgeries whenever indicated was carried out. Patient with closed globe injuries were treated on outpatient basis and follow up. Patient with open globe injuries like corneoscleral tears, suspected intraocular foreign body, globe rupture or iridodialysis with traumatic hyphema were admitted.

IBM SPSS version 29.0 was used for data analysis. Categorical variables were expressed as frequency and percentage, while continuous variables were presented as the mean with standard deviation. The Chi-square test was employed to assess the risk factors linked to poor visual outcomes.

RESULTS

471 eyes of 401 patients were included in the study. Out of 401 patients, 346(86.28%) were males and 55(13.71%) females. There was male preponderance with male to female ratio of 6:1. The median age was 13 years (range:2 years to 68 years). Around 286 patients belonged to age below 18 years, which accounted for 71.32%.

The injuries reported during the Diwali festival was 90.02%, 4.98% during other Indian festivals, remaining 4.98% were reported during new year celebrations, funerals and other events.17.45 percent had bilateral injuries. 26.93% belonged to rural areas and 73.06% belonged to urban areas.

37.40% were self-injuries, 52.61% were bystanders and 9.97% were third party. The type of crackers included bomb (40.64%), Bijli (24.18%), flower pot (17.95%), rocket (7.48%), sparkles (6.23%), sky shots (1.24%) and chakra (0.99%). In around 1.24% cases the type of cracker was unknown and these were third party injuries. 1.24% cases re-ignited the left-over powder of busted crackers.

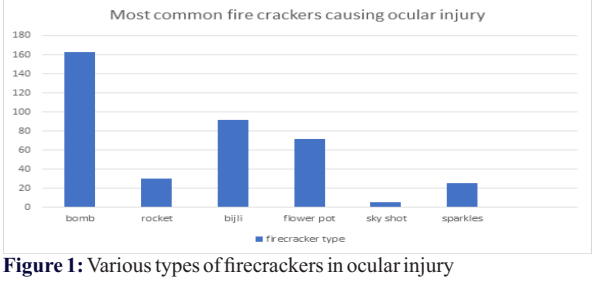

Figure 1: Various types of firecrackers in ocular injury

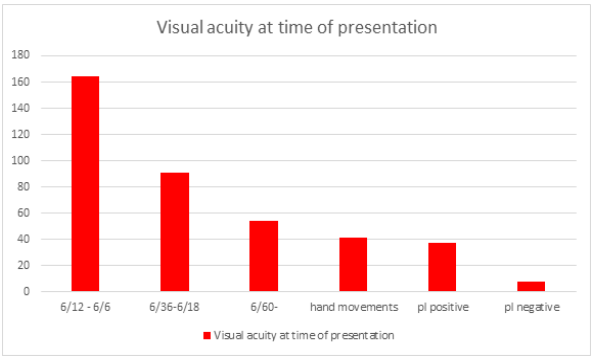

Figure 2: Visual acuity at the time of presentation

The most common were the closed globe injuries (92.01%) which included Contusions (90.52%) and lamellar laceration (1.49%). Open globe injuries were seen in 7.98%. 86 eyes (21.44%) had presenting visual acuity ranging from counting fingers close to face to perception of light, and 1.99% (8 eyes) had no perception of light.

The anterior segment injuries included corneal epidefect (50.87%), anterior uveitis (26.18%), corneal foreign bodies (27.68%), hyphema (23.94%), full thickness corneal tear (7.73%), conjunctival tear (6.48%), iridodialysis (6.23%), lid laceration (4.98%), traumatic cataract (8.72%), traumatic subluxation of lens (2.24%) and lamellar corneal tear (1.49%). 12.21% had associated facial burns.

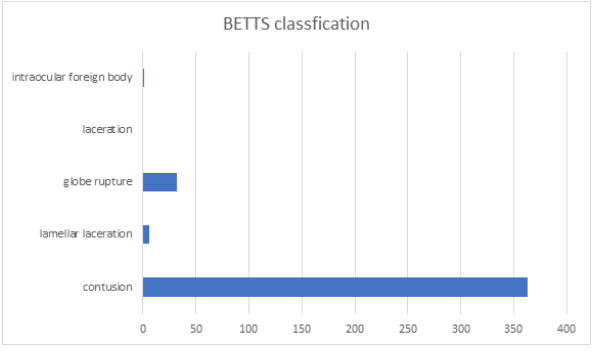

Figure 3: BETTS Classification

The posterior segment injuries were 20.19% which included berlin's edema, vitreous haemorrhage (7.48%), retinal detachment, choroidal effusion, full thickness macular hole and commotio retinae. There was one case of intraocular foreign body in 2015 which was treated surgically. 5 cases (1.24%) were diagnosed with endophthalmitis with poor visual outcome.

25.18% cases were admitted and rest were treated on outpatient basis. Out of the admitted cases, 12.21% underwent surgeries like lid tear repair, primary corneal and scleral tear repair. Remaining inpatient cases underwent conservative management.

The patients with open globe injuries, poor visual acuity at time of presentation and posterior segment involvement had poorer visual outcomes.

DISCUSSION

In this retrospective observational study, the data indicates that males are more frequently injured than females. This can be attributed to higher participation of males in high-risk activities. The median age was 13 years as children are more commonly involved in this recreational activity. This finding highlights the need for targeted prevention strategies and interventions aimed at this age group.

90% injuries occurred during Diwali festival as most firecracker bursting occurs during this festival in an Indian setting. It emphasizes the need for safety campaigns and regulations to minimize harm during this celebratory time.

52% injuries occurred in bystanders highlighting the lack of safety of environment in which firecrackers are busted and impact on innocent bystanders. Most common firecracker causing the injury was bomb firecracker owing to its explosive nature.

Closed globe injuries were more common. The extent and severity of open globe injuries depends on the type and proximity to the firecracker. All the open globe injuries were operated. The closed globe injuries with firecracker particles in the eye were give thorough eye wash and the foreign bodies were removed.

Since most patients are children, the challenge is in examining and treating them effectively as they will be highly uncooperative. But it is the duty of treating ophthalmologist to thoroughly examine and not to miss any findings.

The requirement of surgical intervention in our cases was 12.21%. which depended on the type of injury-closed/open globe, presence of intraocular foreign body and endophthalmitis.

In the 10 years record there was decline in number of cases reported in 2020 and 2021 which would be due to the covid times when there were restrictions imposed. This favours the fact that proper legislations can actually control and diminish the number of ocular firecracker injuries. Poor visual outcomes were associated with open globe injuries, posterior segment involvement and poor vision at the time of presentation.

Table showing comparative analysis of our study with other studies:

1. Study	Our study	Frimmel et al. [4]	Venkatesh et al [5]	Patel and Mukherjee [6]	Chang et al [7]
2.Year	2014-2023	2009-2013 New years	2011-2015 Diwali	2016 Diwali	2003-2013
3.Type of study	Retrospective	Retrospective	Retrospective	Prospective observational	retrospective
4.Sample size	471 eyes (401 patients)	143 eyes (123 patients)	53 eyes (45 patients)	49 patients	327 patients
5.Mean/ median age	13 years	22±13 years	20.55 years	17 years	24.2 years
6.Males, females	Males 86.28% Females 13.71%	Males:87 % Females 13%	Males 87% Females 13%	Males 81% Females 19%	Males 89% Females 11%
7.bystanders	52.61%	53%	55.5%	48.9%	26%
8.closed globe injuries	92.01%	37%	90.56%	67.35%	83%
9.open globe injuries	7.98%	6%	9.53%	26.53%	17%
10.surgery	12.21%	39%	33.96%	44.8%	28%

Limitations of the study include the retrospective nature of the study and recording bias.

Despite these limitations, this study offers a comprehensive overview of the range of ocular injuries, interventions, and outcomes associated with firecracker incidents.

CONCLUSION-

Ocular injuries from firecrackers are a serious concern, especially for children. These injuries can lead to significant vision loss, subnormal vision or even blindness impacting the overall quality of life of the patient. Prevention through education and safety measures is crucial to reduce the risk of such injuries. It is of utmost importance to create awareness for proper supervision and ensuring safety environment during such activities.

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