

Original Research Article

A retrospective observational study of ocular firecracker injuries during Diwali in the year 2023 encountered at a tertiary care hospital in Ahmedabad, Gujarat, India

Neha Parmar*, Yashvi Patel, Sneha Garasia, Vaishali Prajapati,
Arohi Vaghela, Deepika Singhal

Department of Ophthalmology, GMERS Medical College, Sola, Ahmedabad, India

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*Correspondence:

Dr. Neha Parmar,

E-mail: parmarneha2006@gmail.com

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ABSTRACT

Background: Firecrackers are used worldwide to express festive mood inspite of the fact that they can cause severe mental and physical morbidity. Consequently, ocular injuries caused by firecrackers have become a national problem in different countries. The aim was to study the demographic pattern, clinical features, management and prognosis of the patients with firecracker-related ocular injuries during Diwali.

Methods: This institution-based retrospective study was done on patients who attended eye emergency and outpatient department (OPD) of tertiary care center in Ahmedabad, Gujarat. The parameters studied were the age and sex of the patients, severity of injury with respect to active and passive participants, management, severity of injury and visual outcome with respect to type of firecrackers.

Results: A total of 30 patients attended eye OPD and emergency during our study period, of which 91% were male and 9% were female. All of them were of variable age group. All patients were examined on the day of injury. Patients less than 20 years of age were most commonly affected. Visual acuity varied from 6/9 to no perception of light. The most common firework involved was the crackers.

Conclusions: Careless and indiscriminate use of firecrackers may sometimes lead to serious ocular damage. In India, use of fireworks is quite common during various festivals, particularly during Diwali, thus fireworks-related ocular injuries are important causes of blindness. This retrospective study revealed the presentation and outcome of ocular injuries due to firecrackers in this area of mixed culture during this festive week.

Keywords: Diwali, Emergency, Firecracker, Ocular injury, Ocular examination, Outpatient department, Prognosis, Visual acuity

INTRODUCTION

Firecrackers are widely used across the world during festivals, national celebrations and cultural events despite their well-recognized potential to cause significant physical and psychological morbidity.¹ Firework-related ocular injuries represent an important public health concern because they are largely preventable and frequently affect children and young adults.² In India, the extensive use of fireworks during festivals such as Diwali

contributes substantially to the burden of ocular trauma. Children and adolescents are particularly vulnerable because of unsupervised handling of fireworks, inadequate awareness regarding safety measures and risk-taking behavior.³ Ocular injuries caused by firecrackers may vary from mild conjunctival irritation and corneal abrasions to severe vision-threatening conditions such as corneal perforation, hyphema, traumatic cataract, vitreous hemorrhage, retinal injury, secondary glaucoma and globe rupture.⁴ Ocular trauma remains an important cause of

preventable visual impairment worldwide, especially among younger individuals. Firework-related injuries contribute significantly to this burden and frequently require emergency ophthalmic intervention.⁵ Standard ophthalmology literature emphasizes that the severity of ocular trauma depends on the type of injury, mechanism of impact and timeliness of management.^{6,7}

Recent international studies continue to highlight the substantial clinical and socioeconomic burden associated with firework-related ocular injuries and emphasize the need for preventive strategies, public awareness campaigns and legislative interventions.⁸ Despite several studies from different regions of India and abroad, data regarding the demographic profile, clinical spectrum, management and visual outcomes of firecracker-related ocular injuries in Western India remain limited.

Therefore, the present study was undertaken to evaluate the demographic characteristics, clinical features, management and prognosis of patients presenting with firecracker-related ocular injuries during the Diwali festival season at a tertiary care hospital in Ahmedabad, Gujarat, India.

Aim

The aim of this study was to evaluate the patients with firecracker ocular injury

Objectives

The objectives of this study were (a) to study demographic pattern of patients with firecracker ocular injury; (b) to classify the injuries by BETTS classification; (c) to study clinical features of patients with firecracker ocular injuries; (d) to study management of patients with firecracker ocular injuries; and (e) to study prognosis of patients with firecracker related ocular injury.

METHODS

Study type

It was a retrospective observational study

Study duration

The month of Diwali in 2023 i.e. November 2023.

Study setting

Department of Ophthalmology at GMERS Medical College and Hospital, Sola, Gujarat.

Inclusion criteria

Patients who suffered from any form of ocular firecracker injury during the month of Diwali in year 2023 presenting

to the emergency or outpatient department of Sola civil hospital and gave consent to be a part of the study.

Exclusion criteria

Patients who suffered from any other form of ocular trauma other than firecrackers during the specific duration of the study

This retrospective study was conducted in patients with firecracker-related ocular injuries who attended eye emergency and OPD of civil hospital, Sola, Ahmedabad during the period of 1 month of Diwali in 2023. The patients underwent a detailed ocular examination which included assessment of visual acuity (VA), slit-lamp examination, intraocular pressure (IOP) measurement and ocular fundus examination. Gonioscopy, ultrasonography A and B-scan, colour fundus photography, X-ray orbit and optical coherence tomography were done as and when indicated. All patients were examined on the day of injury. Informed consent was obtained from parents/participants.

The injuries are classified according to the Birmingham eye trauma terminology system (BETTS).

RESULTS

Age

The pie chart in Figure 3 showing age distribution of firecracker ocular injury patients. In which 30% were less than 10 years of age, 30% patients were in between 11-20 years of age, 10% patients were in between 20-30 years of age and 30% patients were more than 30 years of age. Above The graph in Figure 4 is showing incidence of close globe and open globe injuries with respect to age. Our studies show that incidence of closed globe injuries were high as compared to open globe injuries. Studies shows that patients of age less than 10 years and patients of age 20-30 years shows significant tendency of open globe injuries in comparison of other age group where incidence of open globe injuries were minimum.

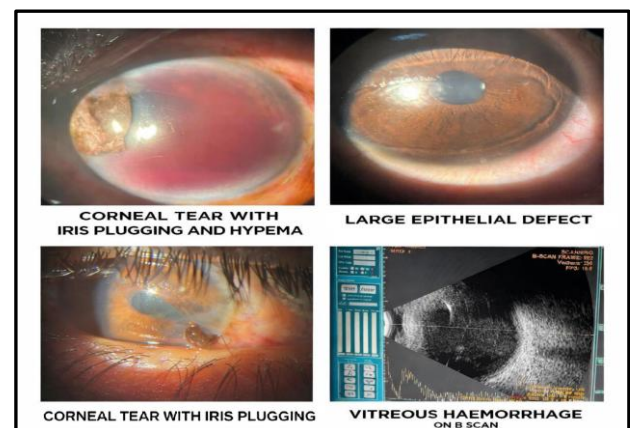


Figure 1: Various firecracker injuries on slit lamp and B scan.

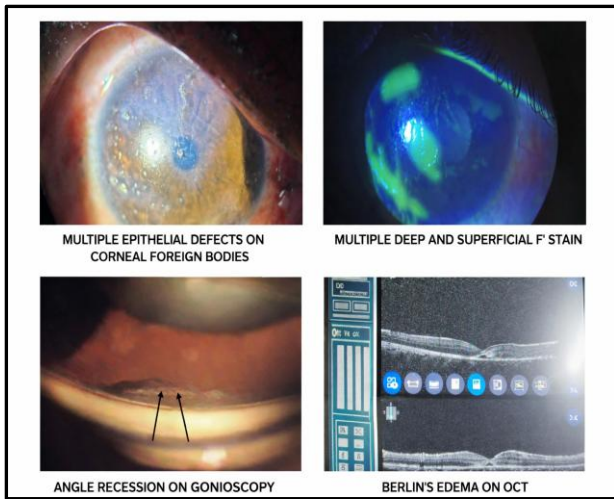


Figure 2: Various firecracker injuries on slit lamp, gonioscopy and OCT.

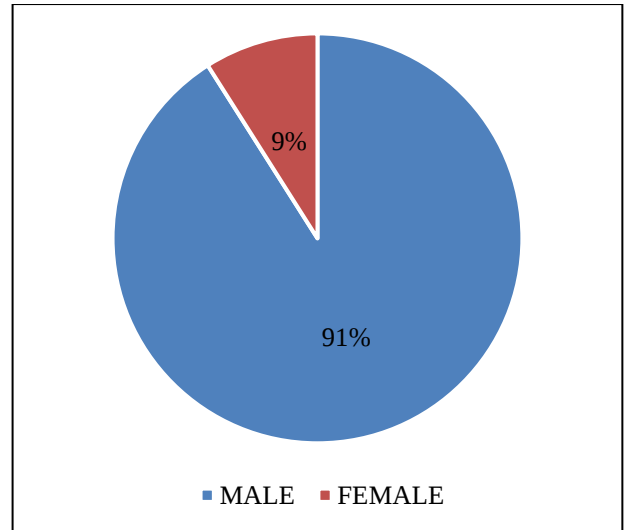


Figure 5: Gender distribution.

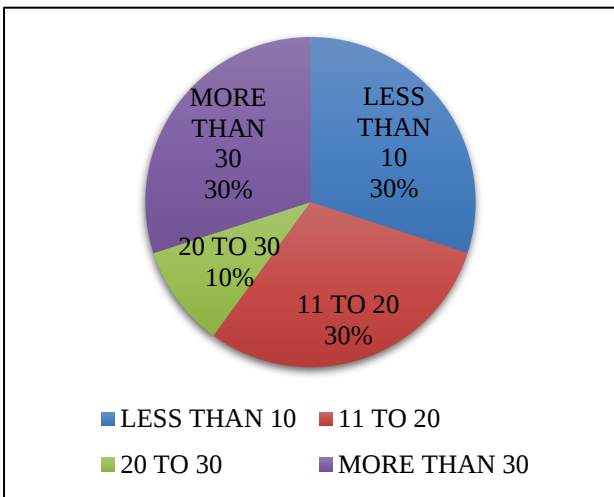


Figure 3: Age wise distribution.

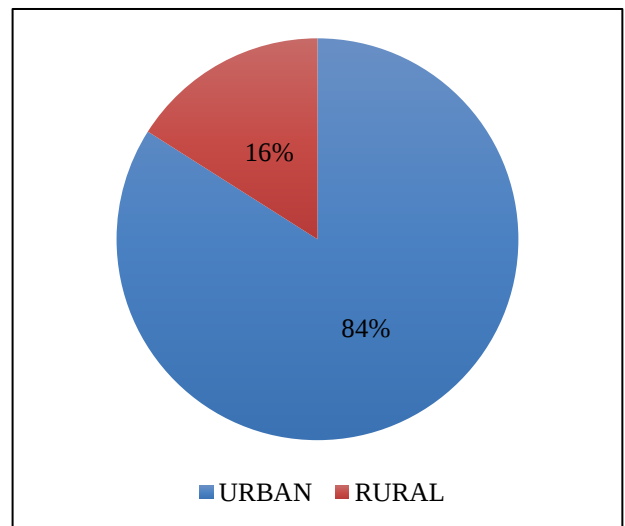


Figure 6: Geographic distribution.

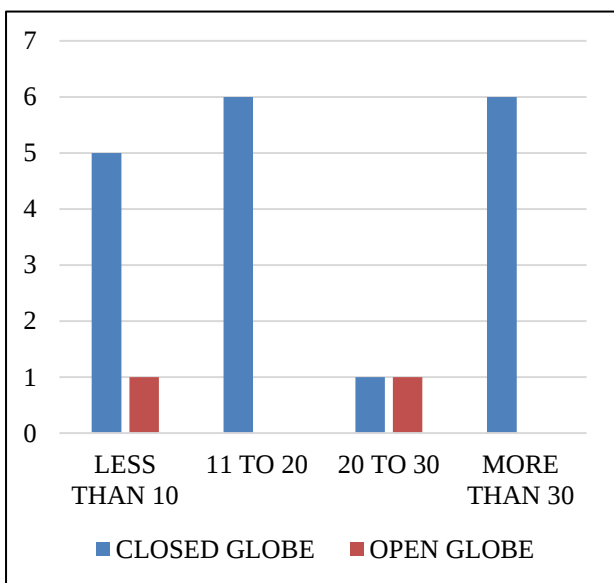


Figure 4: Types of globe injuries.

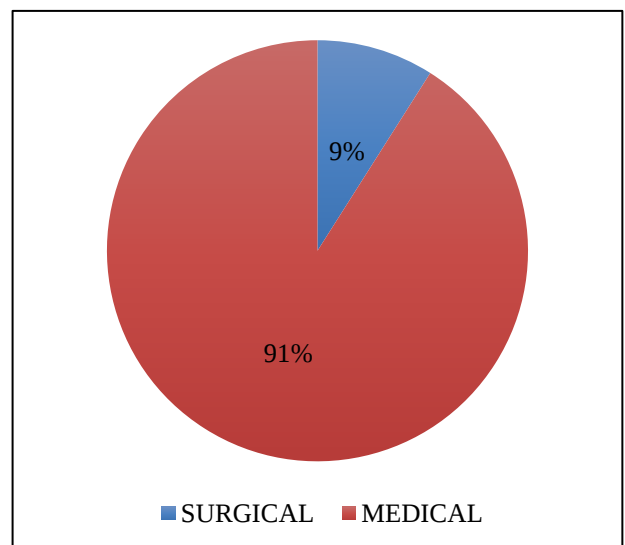


Figure 7: Types of management.

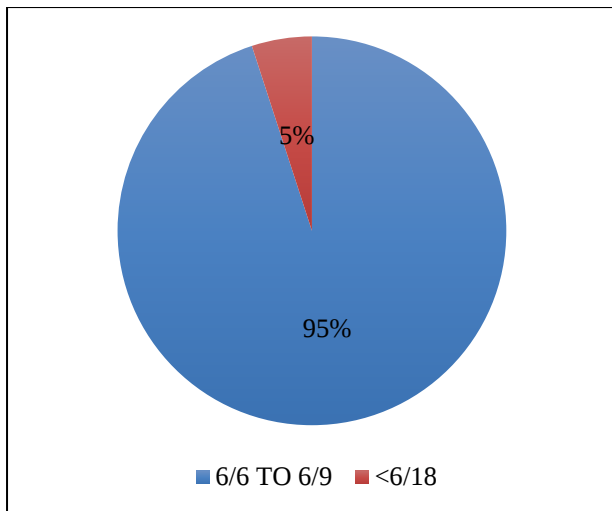


Figure 8: Visual Outcomes.

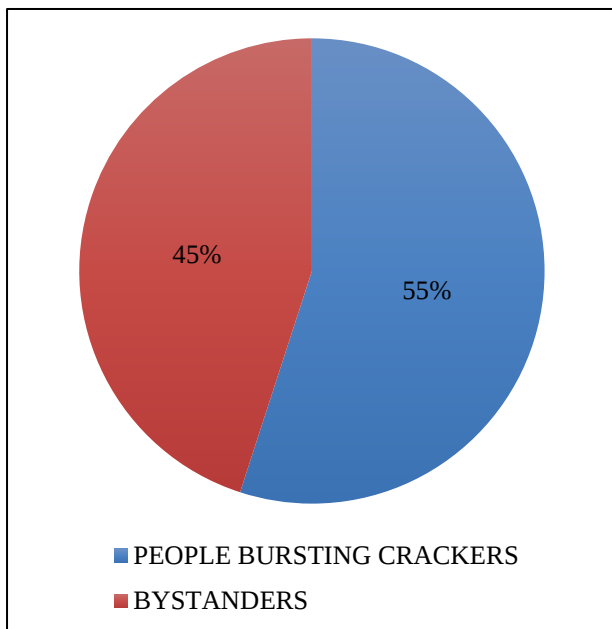


Figure 9: Affected patients: bursting the firecrackers vs bystanders.

Gender and residence

The pie chart in Figure 5 is showing gender distribution in firecracker ocular injury where male 91% patients were male and 9% patients were female. The pie chart in Figure 6 is showing geographic distribution of firecracker ocular injury patients, where 84% patients were from urban areas and 16% were from rural areas.

Management and outcomes

The pie chart in Figure 7 is showing type of managements required in firecracker injury patients, in which 91% patients were treated with medical management. However, 9% patients were needed surgical management. The pie chart in Figure 8 is showing visual outcome of patients of

firecracker ocular injury post treatment, where 95% patients show good visual outcome i.e., visual acuity 6/6-6/9, whereas 5% patients have given visual acuity <6/18.

Fun fact

The pie chart in Figure 9 is showing incident of firecracker injury among patients. Ironically 45% patients were bystanders whereas 55% patients were bursting the firecrackers.

DISCUSSION

Firecracker-related ocular trauma continues to be an important cause of preventable visual morbidity, particularly during festive celebrations such as Diwali. In the present study, most affected individuals were males and belonged to younger age groups. Similar demographic patterns have been reported in studies from Saudi Arabia and Europe, where young males were found to be at greater risk because of increased participation in firework-related activities and greater exposure to hazardous situations.^{9,10}

The spectrum of injuries observed in our study ranged from mild ocular surface injuries to severe globe trauma. Closed globe injuries were more common than open globe injuries. Similar findings have been reported in Dutch surveillance studies and New Year firework injury reports, which demonstrated that ocular surface injuries, corneal abrasions, corneal foreign bodies and blunt trauma constitute the majority of presentations following fireworks-related accidents.^{11,12}

Approximately 60% of patients in the present study were younger than 20 years of age. This observation is consistent with previous studies demonstrating that children and adolescents represent the most vulnerable population for firework-related ocular trauma.¹³ Lack of supervision, curiosity and inadequate awareness regarding firework safety significantly contribute to the increased incidence of injuries in this age group.

A noteworthy finding of the present study was the high proportion of bystander injuries, accounting for nearly 45% of all cases. Similar observations have been reported from tertiary eye care centers in India, where a substantial number of ocular injuries occurred among individuals who were not actively involved in bursting fireworks.¹⁴ Highlights the fact that the risk associated with fireworks extends beyond users themselves and affects the general public exposed to unsafe environments during festive celebrations.

Systematic reviews have further demonstrated that bystanders constitute a considerable proportion of victims and have emphasized the need for stricter regulations, designated fireworks zones and public education regarding safe firework practices.¹⁵ In the present study, the majority of patients were managed conservatively, while only a small proportion required surgical intervention.

Favourable visual outcomes were achieved in most patients, with 95% attaining visual acuity between 6/6 and 6/9 after treatment. Similar outcomes have been reported in multicenter Indian studies where early presentation, prompt diagnosis and timely ophthalmic intervention were associated with satisfactory visual recovery.¹⁶

The findings of the present study reinforce the need for effective preventive strategies, public awareness programs, parental supervision of children, mandatory use of protective eyewear and stricter enforcement of safety regulations to reduce the burden of firecracker-related ocular injuries.

Limitation

Limitation of study was loss to follow up patients.

CONCLUSION

A total of 30 patients with firecracker related ocular injuries were recorded, out of which 12 patients were less than 20 years old. Children <15 years old should not be allowed to use firecrackers without the supervision of an adult. Moreover, 10 patients (45%) out of the 22 were only bystanders, which could have been prevented by stricter laws regarding the usage of firecrackers in residential areas. Raising awareness regarding ocular protection while using firecrackers as well as early detection and timely management of ocular injuries not only prevent ocular disabilities but also mental and socioeconomic debilitation.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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