Section: Ophthalmology

Original Research Article

FIREWORKS RELATED OCULAR INJURIES DURING EID AT A TERTIARY CARE HOSPITAL IN NORTH INDIA

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ABSTRACT

Background: Explosive and combustible fireworks during Eid are often linked to injuries that could be avoided, especially those involving the eyes. The effects of fireworks may be mild like superficial abrasions or serious injuries like open globe injuries that cause eye injury and visual disability. In developing countries, fireworks-related ocular injuries may be a major health issue due to the lack of regulation, safety education, and availability of protective equipment. The purpose of the current research was to assess the demographic aspect, clinical features, treatment patterns, and outcome of fireworks-related eye injuries that presented to Emergency on Eid at a tertiary care hospital in Kashmir.

Materials and Methods: This was an observational study conducted at GMC Srinagar, a tertiary care hospital in Kashmir, where all patients who came with injuries related to fireworks were included in the study during the specified Eid festival. The data including age, gender, firework type, clinical outcome, injury classification used, care given and the best correct visual acuity at the presentation and follow-up was noted.

Results: The results showed that most of the cases were young males (mean ±SD = 13.1 ± 6.5 years) with a substantial number of bystander injuries. The closed globe injuries outnumbered the open globe injuries, but severe visual impairment was mainly related to open globe trauma. Some of the most common clinical manifestations were hyphema (53.1%), corneal abrasions (43.8%), traumatic cataract (21.9%) and globe ruptures (9.4%). Although most patients have responded well to conservative or primary surgical treatment, a sub-group needed vitreoretinal treatment, and a low percentage had poor visual outcomes due to severe structural damage.

Conclusion: Fireworks-related ocular injuries during Eid are predictable but avoidable injuries causing visual morbidity in Kashmir. The community awareness strengthening, encouragement of protective precautions, the regulatory control of using fireworks, and an emergency preparedness during the festival period are the critical elements of public health interventions which may help to decrease the burden of such injuries.

Keywords: Fireworks injury, Ocular trauma, Eid, Kashmir, Visual outcome, public health.

INTRODUCTION

Fireworks as a part of Eid festivities are deeply rooted in most communities to celebrate, share community happiness, and conduct rituals. Without safety precautions or expert oversight, it generates a series of peaks of emergency department presentations of fireworks-associated injuries near these festive times (Parija 2021).[1]

Fireworks lead to predictable, seasonal spikes in the number of cases of ocular trauma. The past surveillance of a multi-country rate and systematic reviews record that a significant proportion of all perennial fireworks-related eye trauma occurs during festivals and national holidays (Gabel-Pfisterer 2024;

Harrison 2024). Hospital series and multicentre reports on ocular trauma in South Asia and India have shown that a large percentage of ocular trauma falls within the periods of the festival, and young male patients are predominant (Parija 2021; Manandhar 2024).Various hospital reports reveal that most of the injured are younger than 30 and that males make up 60-80 percent of the numbers. A significant proportion of the injured are bystanders and not the person directly handling fireworks, which further indicates how especially children and those who watch but do not take part are particularly vulnerable. This population clustering enhances the socioeconomic burden of extreme visual loss of otherwise avoidable incidents (Parija 2021; Al-Barqi 2023).[2-7]

The ocular damage due to fireworks have multiple overlapping mechanisms. Velocity projectiles and shrapnel cause blunt and penetrating injuries (mechanical), which usually lead to corneal tears, rupture of the globe, and foreign body in the eye and damage to the retina. Spark and flame thermal energy has the potential to result in periocular burn, eyelid burn, and thermal corneal and conjunctival burns. Explosive residues and pyrotechnic compounds that touch the ocular surface cause chemical burns, which enhance epithelial defects, extreme inflammation, and secondary infection.

In addition to personal disability, festival-season eye trauma has both direct medical cost (emergency treatment, multiple surgeries, rehabilitation costs) and indirect socioeconomic cost (loss of schooling or employment, burden on a caregiver) in low-resource areas where households are less insulated against the sudden disastrous health bills (Gabel-Pfisterer 2024; Parija 2021).[8,9]

Local epidemiological data will illuminate patterns of injuries (agents, mechanisms, bystander versus active participation), timing and lag to presentation, management requirements (primary repair, vitreoretinal intervention), and short-term visual outcomes - information that is necessary in the development of focally-targeted prevention campaigns and resource allocation.

MATERIALS AND METHODS

This study was an observational, hospital-based study conducted in the Department of Ophthalmology, GMC Srinagar – a tertiary care hospital in North, on Eid-ul-Fitr and Eid-ul-Adha in the Year 2023. Thirty-two patients who presented to the emergency of the Department of Ophthalmology with firecracker injury during the Eid festival were enrolled in the study after taking due consent from the same.

A detailed history including type and mode of injury was taken, and complete ocular examination was done. Visual acuity was recorded with Snellen visual acuity chart and Cardiff acuity chart or picture chart, according to the age of the patients. A detailed slit lamp examination was done to evaluate anterior segment. Intra-ocular pressure measurement was done using non-contact tonometer. Gonioioscopy was done using Sussman gonio-lens. Fundus was evaluated using 90 D slit lamp biomicroscopy and indirect ophthalmoscope. B-scan and CT Scan were also done, when required, to rule out intra-ocular foreign bodies, vitreous haemorrhage and retinal detachment in cases, where fundus was not visible. The injuries were classified according to the Birmingham Eye Trauma Terminology System (BETTS). Severity assessment was further performed using the Ocular Trauma Score (OTS) to predict visual prognosis based on presenting visual acuity and associated clinical factors. The patients were managed according to the injury. The patients were followed up for a period of six weeks. At the end of six weeks, final visual outcome was analysed, Intraocular pressure was measured and fundus examination was done with indirect ophthalmoscope. All the data was entered in Microsoft excel and subsequently analysed. The data was expressed as percentages and proportions.

RESULTS

The number of patients with ocular injuries caused by fireworks on Eid was 32. The mean ±SD was 13.1 ± 6.5 years, showing that children and adolescents were predominantly affected. Majority of the patients were less than 20 years of age, and this showed higher exposure and risk taking in the younger people during the festive celebrations. These results agree with Parija 2021; Manandhar 2024.[10,11]

Most patients were males (81.25%), indicating a strong gender predisposition. This tendency correlates with the latest Indian and global literature as males represent the largest percentage of those affected because they are more active in firework work and outdoor games (Varshney 2024).[12]

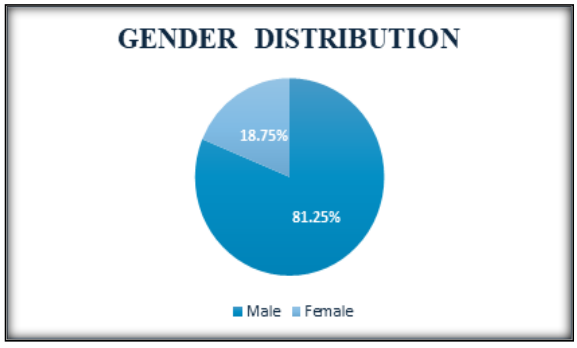
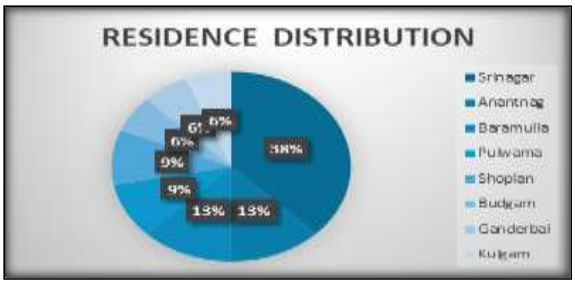


Table 1

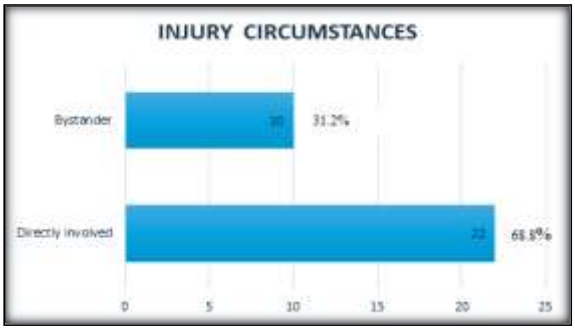
Gender	Number	Percentage
Male	26	81.25%
Female	6	18.75%

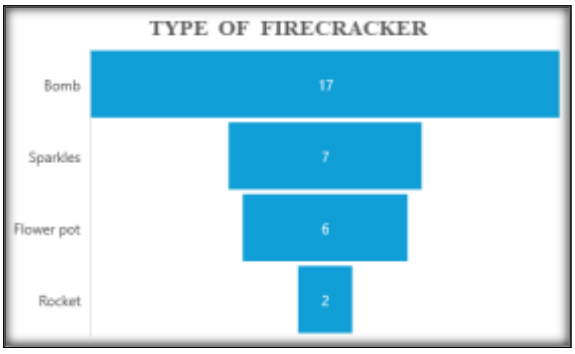
Table 2

Residence	Number	Percentage
Srinagar	12	37.5%
Anantnag	4	12.5%
Baramulla	4	12.5%
Pulwama	3	9.4%
Shopian	3	9.4%
Budgam	2	6.3%
Ganderbal	2	6.3%
Kulgam	2	6.3%



Most cases were reported from Srinagar (37.5%), likely reflecting higher population density and accessibility to the tertiary care centre.

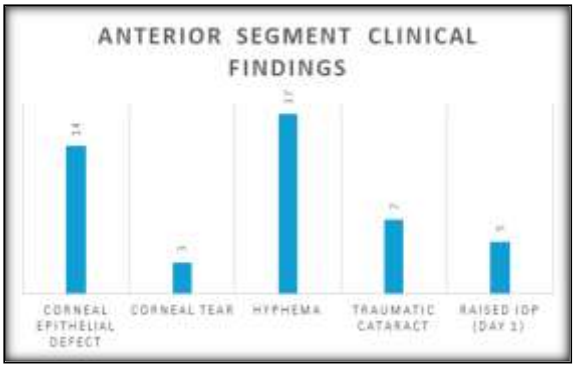




Most injuries occurred in individuals directly handling fireworks (68.8%), but nearly one-third were bystanders, highlighting significant indirect risk. Bomb-type crackers were the most common cause (53.1%), indicating that high-explosive devices are a major contributor to ocular trauma. The same is also observed in the case of the Indian festival-based injury analyses, in which explosive devices are disproportionately involved in causing severe ocular injuries (Parija 2021).

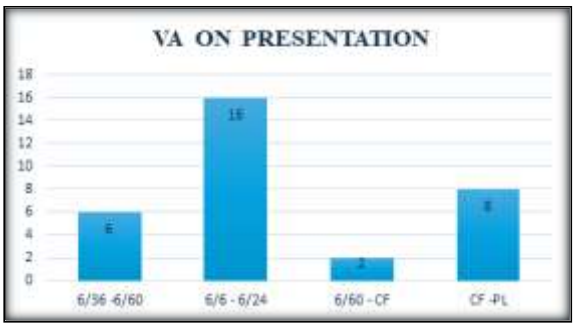
Table 3

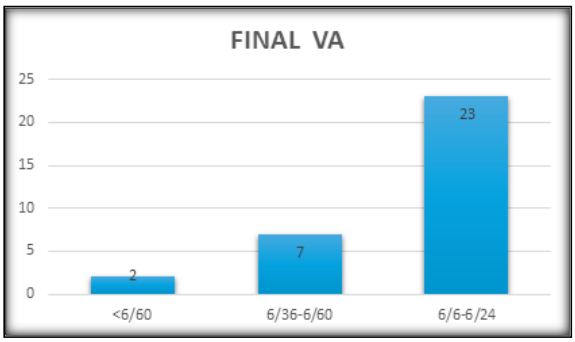
Anterior Segment Clinical Findings	Frequency	Percentage (%)
Corneal Epithelial Defect	14	43.8%
Corneal Tear	3	9.4%
Hyphema	17	53.1%
Traumatic Cataract	7	21.9%
Raised IOP (Day 1)	5	15.6%



Hyphema was the most common anterior segment finding (53.1%), suggesting blunt trauma as a major mechanism. Corneal epithelial defects were also frequent (43.8%). Traumatic cataract occurred in 21.9% of the cases, indicating significant globe impact. Raised intraocular pressure was seen in 15.6% of the patients on the first day.

Posterior segment involvement was relatively less common, but such injuries carry poorer visual prognosis and often require advanced surgical intervention.





Most patients presented with mild to moderate visual impairment and showed improvement at follow-up. Poor final visual outcome was mainly associated with traumatic cataract, corneal tear, or posterior segment involvement. Isolated hyphema and corneal epithelial defect patients had considerable visual recovery. These correlations align with the recent traumatic outcomes research which reports that, an open globe injury, low presenting visual acuity, and involvement of the retina are the main predictors of an adverse outcome (Manandhar 2024; Varshney 2024).[13,14]

Management: Topical antibiotics, steroids, cycloplegics, lubricating and antiglaucoma medication were used in cases where necessary in a large percentage of patients. In the cases of globe rupture or extensive corneal tear, primary surgical repair was done. Early intervention was to reinstate integrity of the globe and avoid secondary complications. Vitrectomy was also recommended in the conditions which involved the posterior segment like vitreous hemorrhage. None of the cases needed evisceration or enucleation throughout the study period, which indicates that they were presented on time and managed well in the majority of cases.

Complications: The secondary glaucoma was found in a subgroup of patients with hyphema and traumatic angle recession. Traumatic cataract was reported in 21.87 percent cases and required surgical management. There was no reported endophthalmitis that was confirmed during the study period which is probably because of the early antibiotic prophylaxis and prompt surgical repair of open globe injuries. Recent sources emphasize that endophthalmitis is a severe but infrequent complication of penetrating wounds of fireworks, especially in relation to IOFB (Parija 2021). In general, although a majority of patients have reported positive visual results. Serious injuries with globe rupture and posterior segment involvement were linked to high morbidity. Such results are in line with the current epidemiological evidence in India and other developing countries (Varshney 2024; Manandhar 2024).[15,16]

DISCUSSION

The current research shows that ocular trauma associated with fireworks on Eid was mostly associated with children and adolescent men, with crackers of the bomb type being the most frequent causative factor. The most common clinical presentations were hyphema and corneal epithelial defects and the open globe injuries and involvement of the posterior segment had worse visual outcomes. These observations show that most of the injuries could have been avoided and that they had been caused mostly by the high-energy explosion devices. These patterns of injury have been found across the recent systematic reviews and regional case series (Varshney 2024; Manandhar 2024). The fact that in most of the closed globe cases, the injuries were unilateral, and the patients recovered their eyesight positively is an indication that access to tertiary care was protective. Nevertheless, this was much worse in those patients with globe rupture or retinal involvement, which is consistent with the contemporary trauma prognostic models (Parija 2021).[17-19]

Research in South Asia has shown that children lack proper supervision, high-intensity fireworks are sold at the street level, and children do not receive safety education, all of which increase the risk of injuries during religious and cultural celebrations (Parija 2021). Safety procedures are not always given much consideration in areas where festive activities are characterized by extensive participation of the community. None of the patients in this cohort had reported the use of protective eyewear when they sustained the injury. Lack of protective eye equipment is also a commonality among international fireworks associated trauma. Protective eyewear is proven to considerably mitigate the level of ocular trauma but their application in the context of festivities fireworks works is extremely uncommon (Varshney 2024).[20]

Recent reviews also highlight the importance of highlighting the fact that even though regulatory frameworks can limit some of the high-risk fireworks, the absence of personal protective gear remains a contributor to preventable morbidity (Manandhar 2024). The almost universal lack of eye protection in the festival environment is a manifestation of the unawareness of the population and its inaccessibility.

Public Health Implications: This study results can be used to support that fireworks-related ocular injuries in Eid are a preventable cause of visual morbidity. Possible targeted interventions in the field of public health involve community-wide education campaigns prior to major festivals, awareness initiatives in schools centered on the issue of paediatric safety, and the tightening of rules on high-explosive fireworks.

Controlled sale policy, zoning of fireworks, and implementing safety precautionary measures have been linked with low injury rates in some jurisdictions (Varshney 2024). Preparation of emergency in high-risk periods in festivals should also be done by the public health authorities.

As the group most affected is children and adolescents, prevention measures need to focus on parental control and education. Ocular trauma has more than just socioeconomic impacts in long term, especially in young people with irreversible visual disability (Parija 2021).

In general, the current results align with recent domestic and global sources among many, which indicates the necessity to urgently implement the region-specific preventive strategies in Kashmir to minimize possible visual impairments.

Limitations

This study was done in one tertiary care centre in Kashmir, which might not be able to reflect the regional data. It was not possible to assess the long-term visual outcomes, late onset complications including secondary glaucoma or the progression of retinal detachment or amblyopia in the paediatric patients. It is possible to underreport cases, especially minor injuries that were treated at home or at the primary care facilities. Some injured individuals may not access tertiary-level care due to social stigma, financial reasons, or ignorance.

Overall Interpretation of Data

- Young males formed the most affected demographic group.
- Bomb-type crackers were the leading cause of injury.
- Hyphema and corneal epithelial defects were the most frequent findings.
- Posterior segment involvement was less common but clinically significant.
- Majority of patients had favourable visual outcomes following appropriate management.

CONCLUSION

Fireworks-related ocular injuries during Eid are predictable but avoidable injuries causing visual morbidity in Kashmir. The community awareness strengthening, encouragement of protective precautions, the regulatory control of using fireworks, and an emergency preparedness during the festival period are the critical elements of public health interventions which may help to decrease the burden of such injuries.

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