(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 7, Issue 3 , Page No: 545-560
May-June 2024

IJMSCR

# A Case Series On Ocular Firecracker Injuries In A Tertiary Care Hospital

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Type of Publication: Original Research Paper
Conflicts of Interest: Nil

**Abstract**

**Purpose:** To study the ocular profile of patients presenting with firecracker injuries.

**Methods:** This retrospective observational study was carried out in a Tertiary Health Care Centre teaching hospital for a period of 2 years. The total number of patients that presented to the casualty and OPD of during this period were 24. Of these patients, the ocular and demographic details along with the activity at time of injury, type of firecracker and time since injury to presentation were noted.

**Results:** Out of the 24 patients, 28 eyes were injured with bilateral ocular injury in 4, 14 with right eye and 6 with left eye injury. The male-to female ratio of 5:1 with maximum patients presenting within the 1–6-hour time period from injury. The most common firecracker was bomb in 11 patients. One patient had a destructive globe injury while 23 patients had closed globe injuries. 14 urban and 10 rural patients were affected with 10 earning members of the family were affected.

**Conclusion:** Firecracker ocular injuries is one of the leading causes of preventable irreversible blindness worldwide. Being more common in the younger age group this helps us in recognizing the importance of early education programs and increasing public awareness. As it affects the earning member in our study, it negatively impacts the wellbeing and development of the family as a whole. With proactive measures and adherence to strict regulations for sale and bursting of fireworks, we can combat the ocular injuries and the morbidity and mortality associated with it. This study thus helps us in understanding the profile and background of ocular firecracker injuries which can help us in formulation of strategies.

**Keywords**: Firecracker, Ocular Injuries, Closed Globe Injuries, Open Globe Injuries.

## Introduction

Fireworks are utilized globally to mark various religious, patriotic, and cultural holidays and festivities. They have been a major display of victory jubilation, happiness pomp and show since the yester years till the current day. In India, firecrackers are widely used to celebrate all different festivals throughout the year with the usage of firecrackers during the Diwali festival being very common [1]. Other festivals also see the use of firecrackers such as Chhath Puja, Kali Puja, Guru Nanak Jayanti, Eid al-Fitr etc. Even around the world during the time of Halloween, Independence Day, Christmas or Chinese New Years firework display has been a routine way of celebration [2].

The use of fireworks in celebrations and holidays makes it an ideal environment for mishaps that lead to severe and dangerous injuries amounting to a substantial amount of morbidity and mortality. Though rules and regulations do exist to prevent injuries, these are usually bent or broken. In October 2017, the Supreme Court prohibited firecracker use in

Delhi. Following in the same footsteps, in 2020, the National Green Tribunal banned cracker sales in the NCR region along with many states in India have either banned or restricted firecrackers to reduce pollution[3]. This led to Council of Scientific and Industrial Research(CSIR) creating "green crackers" with eco-friendly materials which still can cause significant bodily harm[3].

Approximately 7 per 100,000 people in India have experienced injuries associated with firework accidents on a yearly basis[4]. Of these, the head and neck region are the most frequently mentioned areas affected by injuries. Particularly the eyes are the most commonly injured location amounting to 45% with the hands at 38% being the close second[4]. These injuries range from less to more severe and cause irreversible vision loss which can be actually prevented. Commonly seen in children, it leads to lifelong disability, hampers learning, and affects lifestyle[15]. It also causes emotional distress for them and caretakers[5].

Therefore, this study aims to describe the pattern of ocular firecracker injuries as seen in our hospital and to further highlight the inherent dangers associated with the unregulated use of fireworks in the society.

**Materials And Methods-**

A Retrospective observational study was performed of 24 patients. Case Files from the Medical Record Section were analysed of patients who presented with ocular firecracker injury at Casualty and Ophthalmology OPD at tertiary care teaching institute.

Study Design: Retrospective observational study.

Study centre: Department of Ophthalmology and Casualty at a Tertiary Health Care institute.

Study Duration: 2 years (March 2022 – March 2024)

Inclusion criteria - All patients who presented with ocular firecracker injury.

Exclusion criteria - Injuries not associated with any firecracker device and patients not willing for Ophthalmic evaluation/treatment.

This study was done after approval of the Institutional Review Board of the Hospital Ethical Committee and adhered to the tenets of the Declaration of Helsinki. The case files were obtained from the hospital's medical record department.

The patients with firecracker injuries were screened and triaged by the casualty medical officer who in turn called the specific residents for management. Initial rapid assessment was done only after systemically stabilising the patient with consent of the relatives accompanying the patient in a sterile aseptic manner (wearing mask and gloves) under adequate anaesthesia. The Desmarres eyelid retractor for double eversion was used when necessary for initial torch light evaluation. This was followed by slit lamp anterior segment examination if the patient was stable followed by dilated posterior segment examination. Further additional investigations were advised as per case-to-case basis.

Adequate first aid management in the form of adequate saline wash, topical steroids, cycloplegic, antibiotics and adjuvant therapy were started according to case to case basis to enhance the healing processes with control of inflammation. Patients who needed admission was advised admission for further observation and management.

**Brief Examination:**

The patient case records were analyzed for documenting the results. The points of review were:

1. Demographic profile
2. Ocular history
3. Systemic history
4. Type of fire cracker
5. Type of involvement of patient
6. Time required for presentation after injury
7. Uncorrected and best-corrected visual acuity (when possible) using Snellen visual acuity chart
8. Color vision evaluation
9. Amsler Grid evaluation
10. Ocular Movements
11. Intraocular pressure by non-contact/contact tonometry (as possible in required cases),
12. Seidel's test with Fluorescein staining.
13. Detailed slit-lamp anterior and posterior segment findings with 78 or 90D lens or with indirect ophthalmoscope and 20D lens.
14. Radiological investigations (ultrasonography B scan or X-ray Orbit or CT scan) to rule out any intraocular foreign body as and when needed.



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The data were de-identified following completion with data entry and analysis in Microsoft Excel 2016. This was done to protect the patient identity and protect their privacy.

Firecrackers are cylindrical combustible items usually available in packets of variable numbers [6]. They have the following constituents of flash powder which is paper wrapped and has a fuse attached to it, which when ignited bursts with a loud noise [6].

It is made up of reducing and coloring agents, stabilizers, mixture of aluminium, potassium percolate and oxidizers. The coloring agents create the glitter effects [6]. The colors are made up of copper, lithium, antimony sulphide, strontium, aluminium, and barium nitrate which cause noise pollution, poor air quality, smog and water pollution [7].

The commonly used firecrackers are [6]:

1. Bombs are defined as round shaped firework items that burst with a loud noise when the fuse attached to it is lit.
2. Rockets are defined as firework items with a stick attached to it which propels itself into the air.
3. Pot flowers (Anar) are defined as a firework that remains in the ground and emits showers or sparkles several feet in the air when lit.
4. Sparklers (Phuljhadi) are defined as firework items with a non- combustible metallic wire, 8-12 inches long, which on ignition produces sparks and colored flames.
5. Ground Spinners (Chakri)

The Birmingham Eye Trauma Terminology System (BETTS)in 2000s helped provide a standardized classification for the mechanical injuries to the eye globe. It is the commonly used classification system [8,10,11,12]. Other classification system is OTS (Ocular Trauma Score) which helps us in prognosticating the visual outcome in trauma patients with open globe injury with 80% predictive accuracy [9,11,12].

The most recent one is from the Ocular Trauma Classification Group which has further developed a classification system at primary evaluation for mechanical injuries of the eye. It has been adapted from the original classification proposed by Kuhn et al [10,11,12].

**Fig1: BETTS**

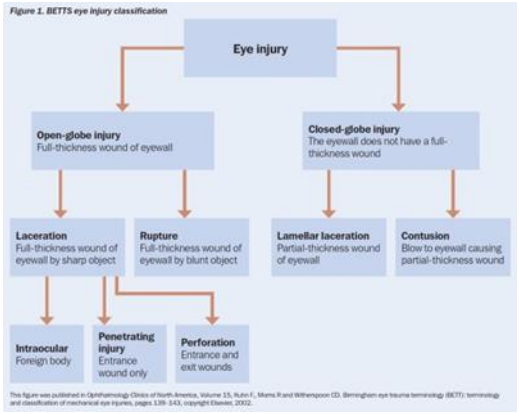
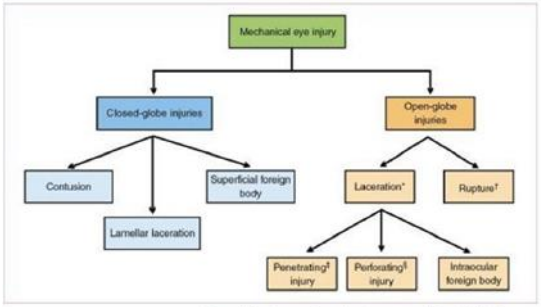



**Fig2: Ocular Trauma Classification Group**




Classification of ocular trauma. *Outside-in injury; †inside-out injury; ‡single break in eye wall; §through-and-through injury of globe, dual breaks or double perforation. Source: (Adapted from Kuhn et al. *Ophthalmology* 1996;103:240–243.)

Injuries are classified into two categories [11]:

1. Open globe—full-thickness defects in the corneoscleral coat of the eye.
2. Closed globe—ocular injury without a full-thickness defect of the coats.

It described three zones in both these categories, from the anterior segment backwards till the posterior segment.

These injuries are further detailed with four variables—type, grade, zone and presence or absence of RAPD.



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System for classifying open globe injuries: [11,12]

Type of injury

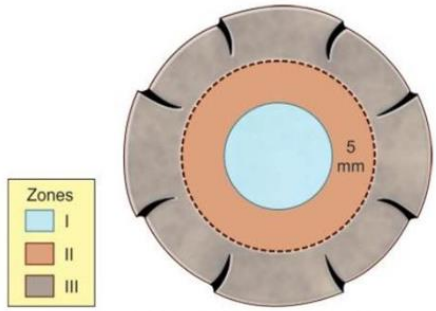
a. Rupture
b. Penetrating
c. Intraocular foreign body
d. Perforating
e. Mixed

Grade (visual acuity at presentation)

i. ≥ 20/40
ii. 20/50 to 20/100 iii. 19/100 to 5/200
iii. 4/200 to PL+
iv. Absence of light perception

Pupillary response

a. Relative afferent pupillary defect (RAPD) present in the injured eye
b. No RAPD in the injured eye




*Zones of the eyeball as per the ocular trauma classification*

1. Cornea and limbus
2. Limbus to 5 mm posterior into the sclera
3. Posterior to 5 mm from the limbus

(The posterior most opening in the eyeball is considered.)

System for classifying closed globe injuries: [11,12]

Type

1. Contusion
2. Lamellar laceration
3. Superficial corneal foreign body
4. Mixed

Grade (visual acuity at presentation)

i. ≥ 20/40

ii. 20/50 to 20/100 iii. 19/100 to 5/200

iv. 4/200 to PL+

v. Absence of light perception

Pupillary response

a. RAPD present in the injured eye

b. No RAPD in the injured eye

Zone

i. External, limited to bulbar conjunctiva, sclera and cornea.
ii. Anterior segment includes structures of anterior segment along with pars plicata and the lens apparatus.
iii. Posterior segment includes all internal structures posterior to posterior lens capsule.

The posterior most structure showing evidence of structural alteration is taken into consideration.



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**Results**:

After the analysis of the case records of the patients with firecracker injuries, the following results:

1. 24 patients of which 20 males (83.33%) and 04 females (16.67%) with male-to female ratio of 5:1 was noted to have ocular injuries due to firecrackers. 14 patients were from the urban background and the rest 10 from the rural background.
2. The adult (more than 18years) to children (less than 18years) ratio in our study was 5:3 with majority number of patients in the age group of 21 to 30 years followed by the age group of 11 to 20 years.
3. Of the 9 children who were injured, 5 were under supervision with an adult while 2 had no supervision and 2 whose details were not known.
4. 18 patients were actively involved in bursting of firecrackers, 5 patients were just mere bystanders with one patient whose details were unknown as he was brought by good samaritan.
5. 11 patients were injured by bombs followed by 5 patients injured by pot flower(anar) and rockets, 3 were injured by sparkles (phuljhadi)
6. Of the 28 injured eyes, the right eye was involved in 14 (58.33%), left eye 06 (25 %) and bilateral involvement was seen in 4 patients (16.67%). The distribution of visual acuity of these injured eyes on Snellen's fraction on presentation had 1 eye with No PL (destructive globe injury), 11 eyes each with vision in the range of 6/6 to 6/12 and 6/18 to 6/36, 1 eye in the vision range of 6/60 to FC 3MTR and 4 eyes in the range of HM, PL+ to less than FC 3Mtrs.
7. The anterior segment was involved in 24 eyes, the posterior segment was involved in 2 eyes with both segments were involved in 2 eyes.According to the OTCG classification, 95.83% (23) were closed globe injuries and 1(04.17%) patient had a destructive globe injury in whom only macerated and burnt tissue was seen with no orbital contents that could be identified. Further, 11 patients had Closed Globe Injuries: Superficial Foreign Body, 6 patients had Closed Globe Injuries: Contusion, 4 patients had Closed Globe Injuries: Mixed with 1 patient of Closed Globe Injury: Lamellar Laceration.
8. 17 of the 24 patients did not take any treatment. 14 of these 17 patients (58.33%) presented to the casualty within 1 to 6 hours of injury. 3 patients (12.5%) were prompt in presenting to the hospital in less than 1 hour since injury. 7 patients who took first aid management from which 5 patients who presented after 24 to 48 hours and only 2 patients who presented within 2 hours.
9. Of the 24 patients, 13 were students, 1 was a homemaker/housewife and 10 were earning member of the family.
10. Of the 24 patients, 10 were from Below the poverty line, 9 from the Lower middle class and 2 from the middle class and rest 3 from the upper middle class. Majority of the BPL and lower middle class injured patients were the earning members of the family.



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**TABLE 1: DISTRIBUTION OF PATIENTS BASED ON DEMOGRAPHIC DETAILS**

| DEMOGRAPHIC DETAILS | | NUMBER OF PATIENTS (TOTAL = 24) |
|---|---|---|
| AGE | 0-10 YEARS | 5 (20.83%) |
| | 11-20 YEARS | 7(29.17%) |
| | 21 – 30 YEARS | 9 (37.5%) |
| | 30 – 40 YEARS | 3 (12.5%) |
| GENDER | MALE | 20 (83%) |
| | FEMALE | 04 (17%) |

**TABLE 2:DISTRIBUTION OF PATIENTS BASED ON TYPE OF FIRECRACKER AND THE CAUSE OF INJURY**

| CHARACTERISTIC | | TOTAL NUMBER OF PATIENTS (TOTAL = 24) |
|---|---|---|
| CAUSE OF INJURY | BYSTANDER | 05 (20.83%) |
| | ACTIVELY BURSTING CRACKERS | 18 (75.00%) |
| | DETAILS UNKNOWN | 01 (04.17%) |
| TYPE OF FIRECRACKER INVOLVED IN INJURY. | POT FLOWER (ANAR) | 05 (20.83%) |
| | ROCKET | 05 (20.83%) |
| | SPARKLES (PHULJHADI) | 03 (12.5%) |
| | BOMB | 11 (45.84%) |



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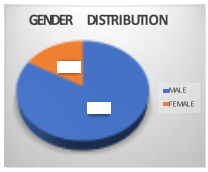


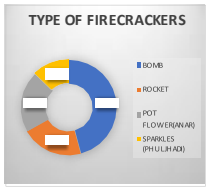


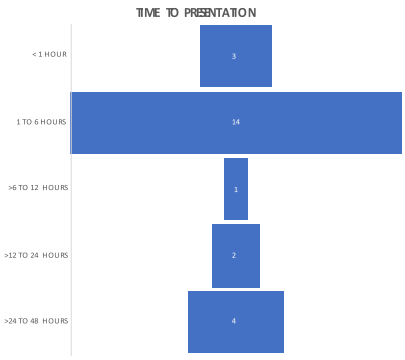


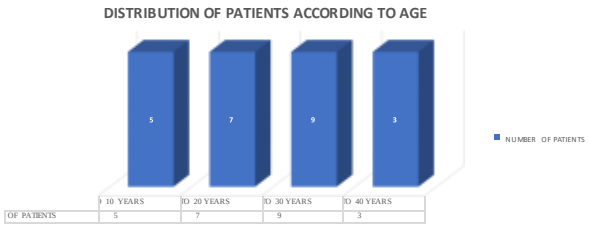


**TABLE 3 :DISTRIBUTION OF PATIENTS BASED ON FIRST AID MANAGEMENT AND TIME TO PRESENTATION**

| CHARACTERISTIC | | TOTAL NUMBER OF PATIENTS (TOTAL = 24) |
|---|---|---|
| FIRST AID MANAGEMENT | TAKEN | 07 (29.17%) |
| | NOT TAKEN | 17 (70.83%) |
| TIME TO PRESENATATION | LESS THAN 1 HOUR | 03 (12.5%) |
| | 1 TO 6 HOURS | 14 (58.33%) |
| | >6 TO 12 HOURS | 01 (04.17%) |
| | >12 TO 24 HOURS | 02 (08.34) |
| | >24 TO 48 HOURS | 04 (16.66%) |



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**TABLE 4 :DISTRIBUTION OF PATIENTS BASED ON INVOLVEMENT OF EYES**

| CHARACTERISTIC | | TOTAL NUMBER OF PATIENTS (TOTAL = 24) |
|---|---|---|
| EYES | RIGHT EYE | 14 (58.33%) |
| | LEFT EYE | 06 (25.00%) |
| | BOTH EYES | 04 (16.67%) |

**TABLE 5 :DISTRIBUTION OF PATIENTS BASED ON ANATOMICAL SEGMENT INVOLVEMENT OF INJURED EYES**

| CHARACTERISTIC | | TOTAL NUMBER OF EYES (TOTAL = 28) |
|---|---|---|
| ANATOMICAL SEGMENT INVOLVEMENT | ANTERIOR SEGMENT | 24 (85.72%) |
| | POSTERIOR SEGMENT | 02 (07.14%) |
| | BOTH SEGMENTS | 02 (07.14%) |

**TABLE 6 :DISTRIBUTION OF PATIENTS BASED ON VISUAL ACUITY AT PRESENTATION**

| CHARACTERISTIC | | TOTAL NUMBER OF INJURED EYES (TOTAL = 28) |
|---|---|---|
| VISUAL ACUITY AT PRESENTATION (IN SNELLEN FRACTION) | 6/6 TO 6/12 | 11 (39.29%) |
| | 6/18 TO 6/36 | 11 (39.29%) |
| | 6/60 TO FC 3MTR | 01 (03.57%) |
| | HM, PL+ to < FC 3MTR | 04 (14.28%) |
| | NO PL | 01 (03.57%) |



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**TABLE 7:DISTRIBUTION OF PATIENTS BASED ON TYPE OF INJURY AND OTCG CLASSIFICATION.**

| CHARACTERISTIC | | TOTAL NUMBER OF PATIENTS (TOTAL = 24) |
|---|---|---|
| TYPE OF INJURIES | CLOSED GLOBE INJURY | 23 (95.83%) |
| | OPEN GLOBE INJURY | 00 |
| | DESTRUCTIVE GLOBE INJURY | 01 (04.17%) |
| TYPE OF INJURY ACCORDING TO OTCG | CLOSED GLOBE SUPERFICIAL CORNEAL FOREIGN BODY | 12 (50.00%) |
| | CLOSED GLOBE CONTUSION | 06 (25.00%) |
| | CLOSED GLOBE MIXED | 04 (16.67%) |
| | CLOSED GLOBE LAMELLAR LACERATION | 01(04.17%) |
| | DESTRUCTIVE GLOBE | 01(04.17%) |

**TABLE 8 : DISTRIBUTION OF PATIENTS BASED ON ADDRESS BACKGROUND**

| BACKGROUND | TOTAL |
|---|---|
| RURAL | 10 |
| URBAN | 14 |



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**TABLE 9 : DISTRIBUTION OF PATIENTS(CHILDREN) BASED ON DETAILS OF SUPERVISION**

| BACKGROUND | TOTAL ( TOTAL 9 CHILDREN WERE INJURED) |
|---|---|
| SUPERVISION | 05 (55.56%) |
| NOT SUPERVISED | 02 (22.22%) |
| DETAILS NOT KNOWN OF SUPERVISION | 02 (22.22%) |

**TABLE 10 : DISTRIBUTION OF PATIENTS BASED ON SOCIOECONOMIC STATUS AND PROFESSION**

| CHARACTERISTIC | | TOTAL |
|---|---|---|
| SOCIOECONMIC STATUS | BELOW POVERTY LINE | 10 |
| | LOWER MIDDLE CLASS | 9 |
| | MIDDLE CLASS | 2 |
| | UPPER MIDDLE CLASS | 3 |
| PROFESSION | STUDENTS | 13 |
| | HOMEMAKER/ HOUSEWIFE | 01 |
| | EARNING MEMBERS/ EDUCATED | 10 |
| | TOTAL | 24 |



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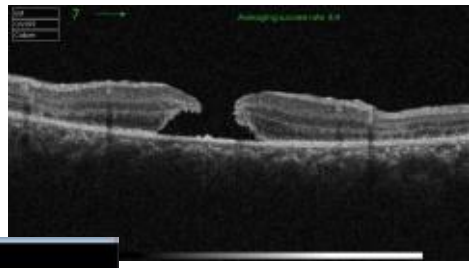
**Fig1: OCT Macula of patient with MACULAR**



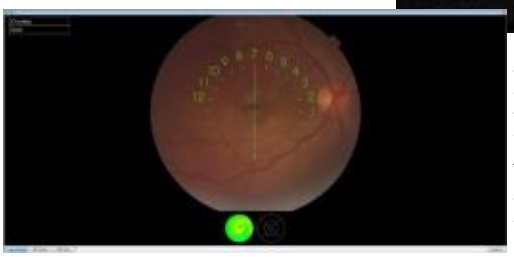
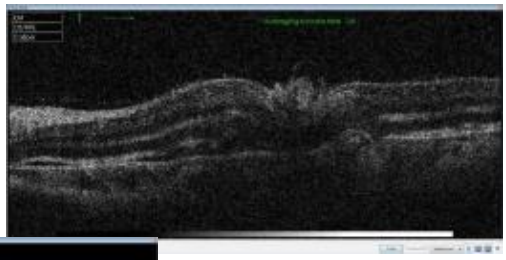


**Fig1.A: Fundus Photo of patient with MACULAR HOLE**



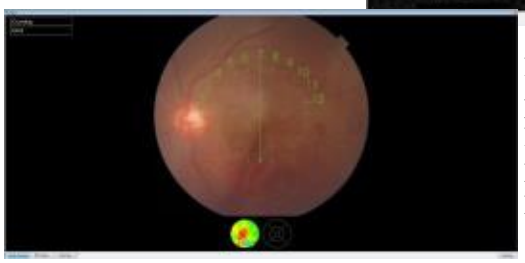


**Fig 2.A: Fundus Photo of patient with: PRERETINAL HEMORRHAGE & MACULAR EDEMA**

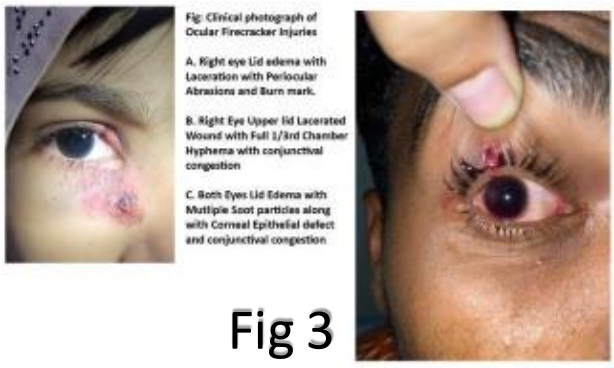



Fig 3



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Fig 4


Fig 5

Figure: Clinical Picture of Ocular Firecracker injury of a patient with a Destructive Globe Injury

**Discussion:**

Eyes make up 0.27% of body surface area and 4% of face, yet rank third for injuries after hands and feet. In 2018, the honorable Supreme court of India had restricted the permissible duration of bursting firecrackers to 2 hours on the day of Diwali [18]. In firework-related injury, head and neck region in particular the eyes (45%), are the most common site followed by hands (38%) [4].

Ocular trauma leads to about 5% of irreversible/permanent blindness in India [11].It is the second leading cause of unilateral blindness in Nepal (13.6%), after cataract (34.2%) [14]. It is one of the common causes of preventable blindness worldwide as well. Firework injuries are responsible for about 2% of all reported ocular injuries [16]. American Academy of Pediatrics reported a 20% of injuries as firework-related with some studies reporting more than 31 percent [15].



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To calculate the burden of these fireworks related injuries, multiple studies were carried out. The use of firecrackers in festivities had affected 85,800 children from 1990 to 2003 in United States of America (Witsaman et al, 2006). While annually in Greece, 7 of 1 lac children are affected (Vassilia et al, 2004). In Denmark through a 12-year study, 4447 patients were injured during the New Years (Foged et al, 2007). In India, 1 per 1 lac are injured by firecrackers [19,20]. In China months adjacent to the Chinese New Year festival have a high rate of firework-related ocular trauma (Wang et al, 2017) [19]. This brings to our notice that firecracker ocular injuries during festival season are a global problem.

In our study of the 24 patients, 83% were male patients and 17% were female patients with 17% patients with bilateral injury and 83% with unilateral injury. Of the unilateral injury patients, 14 eyes were right eyes and 6 were left eyes. In total, 28 injured eyes were found. In our study, anterior segment was involved in 24 eyes, the posterior segment was involved in 2 eyes with both segments involved in 2 eyes. The age of patients ranged from 1–40 years with the majority number of patients in the age group of 21 to 30 years followed by the age group of 11 to 20 years. The median age of our study was 20 years. There were no patients more than 40 years of age. This reinforces the more adventure seeking uninhibited personality of the younger generations. The adult (more than 18years) to children (less than 18years) ratio in our study was 5:3. The minimum age of patients was 7 years (3 patients) and the maximum age was 39 years (1patient). The mode age of our study was 7 years and 21 years with 3 patients each.

This is similar to the findings of another retrospective study at a tertiary eye hospital in Tamil Nadu, India during three consecutive Diwali festivals (from 2013 to 2015). They had 96.3% unilateral injury in 81 % male patients in which 55.5% patients were less than 18 years of age. The highest incidence of firework-related injuries has been seen in the 5–20-year-old age group [21]. Lodhi et al, also evaluated 28 injured eyes from which right eye was more injured with majority being males and bystanders (56.5%) [22]. This possibly might be due to the prevailing influence of the right eye and the individual getting nearer to the firecracker to verify whether it has been ignited [22]. Another study in Tamil Nadu noted that 81.7% male patients had 81.8% unilateral injuries with the median age being 13 years and 63.4% patients were from the urban background [21]. However, the average age of our study was17 years. However, the average age of the patients in a 11-year study period evaluated at a level 1 Trauma center in the USA by Chang et al was slightly higher at 24.2 years (±13.2 years) [16]. There were 37% being less than 18 years old which is similar to our study of 37.5%. Male patients accounted for 89% and 11% were female cases [16]. Even the male to female ratio were similar in our study and this study.

A study by Kuhn et al demonstrated a 61% of the firecracker injuries occurring in children [23]. These findings agree with the findings reported by Mohan et al with a male: female ratio of 5:1[24]. Chakraborti, et al., found in their study that 96.7% patients were under the age group of 15 years [25].

Diving in the details of supervision of the 9 injured children (less than 18 years of age), we found that 5(55.56%) were not supervised and 2(22.22%) were supervised and details of supervision of 2 injured children was not known. In the study from 1996, Smith et al concluded that the presence of an adult supervisor although present for 54 percent of firework injured children [26].Experimental temperament and adventurous nature of children makes them more vulnerable to these injuries [27].

OO Adenuga et al noted a preponderance of CGI in his study with 87.7% while our study had a higher number of closed globe injuries (95.83%) [17]. Studies from Britian [28] and United States [18] along with other studies in India [29,30] showed a higher number of closed globe injuries. China documented that the spring festival was more related to the firework-related injuries with a higher proportion of Open Globe Injuries [16]. Malla T et al also documented similar to our study the preponderance of closed globe injuries (78.5%) in their study [6].

Bombs followed by pot flower (anar) were most common firecrackers causing injury to patients in our study in agreement with Patel and Mukherjee et al [29]. The firecracker with least injuries were sparkles (phuljhadi), but it should not be taken lightly. Sparklers might look innocent compared to the other firecrackers available, but they burn at 1200-degree Fahrenheit. Such high temperature is sufficient enough to melt glass and gold and can causes third-degree skin burns and devastating ocular trauma. Studies done by Malla T et al [6] and Venkatesh et al [21] in 2017



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however had majority of the injuries by firecrackers (56.1%) and an equal number (12.3%) by bombs, rockets and sparklers each which differed slightly from our study. Bhatnagar A et al in 2020 had similar findings like our study [31]. Lodhi et al in agreement to our findings had maximum injuries by bombs [22].

Firecracker Injuries in bystanders is common ranging from 14 to 61% [32]. In our study 75% were actively involved in bursting firecrackers while details of 1 patient (4.17%) were not known to us. Patel et al reported that 48.9% of their patients were bystanders [29]. Wisse et al also reviewed that an average of 47% of the cracker injury victims were bystanders [19]. However, Chakraborti et al had maximum injuries to the bystanders/passersby and not actively involved in bursting firecrackers [25].

In our study of the 24 patients, 14 patients (58.33%) presented to the casualty within 1 to 6 hours of injury and 3 patients (12.5%) were prompt in presenting to the hospital in less than 1 hour since injury. There were only 7 of the 24 patients who took first aid management. 5 patients who presented after 24 to 48 hours and only 2 patients who presented within 2 hours of the injury. Rest 17 of the 24 patients did not take any first aid management. Malla T et al noticed that 78.9% had received first aid management in their centre [6]. They also stated that 14% patients presented within less than 1 hour, 21.1% patients presented within 1-6 hour, 15.8% within 12 hours, 10.5% in more than 12 hours to 24 hours, 14.0% in more than 24 hour to 48 hour time period and 22.8% presented after 48 hours [6].

Visual acuity was evaluated of these injured eyes on Snellen's fraction on presentation. We had 1 eye with No PL (destructive globe injury), 11 eyes each with vision in the range of 6/6 to 6/12 and 6/18 to 6/36, 1 eye in the vision range of 6/60 to FC 3MTR and 4 eyes in the range of HM, PL+ to less than FC 3Mtrs. Referring to study from Chakraborti et al., they had 2 patients with no perception of light, 5 patients with VA of <6/60, 7 patients had 6/60–6/18, while 16 patients had ≥6/12 which had a similar distribution as our study [25]. Kaur K et al had majority eyes with ≥20/200 followed by 20/200 to 20/1200 followed by hand movement to perception of light (PL) in 6 eyes, and No PL in 1 eye [33].

Based on the BETTS classification, the closed globe injuries were more common 95.83% and one patient had a destructive globe injury in whom no orbital contents could be identified which can draw similar parallels from the study by Chakraborti, et al., in whom 4 cases (13.3%) were open-globe injuries and 26 cases (86.7%) were closed-globe injuries, 14 patients (68%) presented with various corneal injuries [25]. Lodhi et al also had similar findings like our study where 22 eyes had closed globe injuries and only one eye had open globe injury [22]. Kaur K et al in their study also noted 94.69% of CGI and 5.30% of OGI with more occurrence of CGI [33].

According to the Ocular Trauma Group guidelines [11,12], 11 patients had Closed Globe Injuries: Superficial Foreign Body, 6 patients had Closed Globe Injuries: Contusion, 4 patients had Closed Globe Injuries: Mixed with 1 patient each having Closed Globe Injury: Lamellar Laceration and Destructive Globe Injury. Erdurman FC et al noted 80% eyes suffered open-globe injury and rest 20% had closed-globe injury with right eye affected in 21%, the left eye affected in 23% cases and bilateral involvement 56% of the patients of which 12 eyes with closed-globe injury [34]. It had contusion 92% eyes and only one eye showed lamellar laceration after injury [34].

In our study, 13 patients were students, 1 was a homemaker/housewife and 10 were earning member of the family. While 10 patients were from Below the poverty line, 9 from the Lower middle class and 2 from the middle class and rest 3 from the upper middle class. Majority of the BPL and lower middle class injured patients were the earning members of the family. This affliction to one of the primary sense organs i.e. the eyes, could affect the livelihood of the entire family and negatively impact the growth and future of the same family. We found no such study which compared the details of the education and earning status of the patients.

Thus, it is important to understand the need for prompt referral to ophthalmologists for adequate treatment. For students, targeting the educational institutes with flyers and pamphlets or inclusion in coursebooks could help reduce such devastating ocular injuries [30]. Other methods to reduce the incidence of ocular firecracker injuries can be using the social media reach of celebrities to educate the masses [30]. A leaf can be taken from the regulations regarding cigarette manufacturing where there is compulsion to print pictures of traumatized eyes to raise awareness [30].



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**Conclusion**: Ocular firecracker injuries range from mild eyelid burns to devastating effects like vision loss and even loss of eyes. These are preventable causes of ocular trauma and thus there is a major need for creating awareness for patient safety to tackle the firework related injuries with strict enforcement of the existing laws as injury to the eye can affect the wellbeing of the family of the patient and even affect the psyche of the patient.

The limitation of our study is its small sample size and the retrospective nature of the same.

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