

## An Epidemiological Study on Prevalence and Pattern of Traumatic Ocular Injuries in a Teaching Hospital in Northern India

MOHD DILAWAR MIR

Senior Resident

Department of Community Ophthalmology  
Sheri-i-Kashmir Institute of Medical Sciences  
Soura, Srinagar (Jammu & Kashmir), India

ASIF JEHAN

Senior Resident

Department of Community Ophthalmology  
Sheri-i-Kashmir Institute of Medical Sciences  
Soura, Srinagar (Jammu & Kashmir), India

SYED SHUJA QADRI\*

Senior Resident

Department of Community Medicine  
Sheri-i-Kashmir Institute of Medical Sciences  
Soura, Srinagar (Jammu & Kashmir), India

HUMAIRA BASHIR

Senior Resident

Department of Microbiology, SKIMS Medical College Bemina  
(Jammu & Kashmir), India

SYED FARHAT ABIR

Gynecologist

J&K Health Services  
Srinagar, Kashmir, India

SYED ABIR HUSSIAN

Surgeon

J&K Health Services  
Srinagar, Kashmir, India

### Abstract:

**Background:** Ocular trauma is a major cause of preventable blindness and visual impairment in the world. Despite its public

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\* Corresponding author: ssaqadri@yahoo.com

health importance, there is relatively less data on magnitude and risk factors for ocular trauma, especially from developing countries. Hence to plan effective interventions, it is essential to have information on the extent and pattern of Ocular injuries. **Objective:** To determine prevalence and pattern of ocular injuries in patients admitted in department of Community Ophthalmology, Sheri-i-kashmir Institute of Medical Sciences, Srinagar (J&K). **Design:** Hospital -based cross-sectional epidemiological study conducted between January to December 2012. The eye department serves as a major referral centre. 98 patients who received eye injuries were assessed and admitted in hospital and managed accordingly. All patients were interviewed and underwent detailed ocular examination. Injuries were classified according to Birmingham Eye Trauma Terminology and System for classifying ocular Injuries. Ocular Trauma Score (OTS) was calculated. **Results:** A total of 98 patients were admitted after sustaining ocular trauma. Maximum patients (77.55%) reported in hospital within 12 hrs of injury. Main cause of injury was due to stones (28.57%) while pelting stones against combat forces, followed by pellets (15.30%). Closed globe injuries were seen in more number of patients (60.20%). Most of the open-globe injuries were due to pellets and stones of Type B and C, Grade D, Zone I and II with Relative Afferent Pupillary Defect (RAPD) in 21.73% of the cases. Closed-globe injuries were mostly of Type A, Grade A and D, and Zone I and II with RAPD in just 8.47% of patients. **Conclusion:** Taking into consideration the mass uprising all around Kashmir (India), the turmoil related injuries outnumbered occupational, sports, assault and domestic injuries. Since most of turmoil associated injuries were visually significant, it becomes mandatory to educate community and inform about importance of preventive measures during violent activities.

**Key words:** Stones; pellets, Open globe injury; Closed globe injury; Birmingham Eye Trauma Terminology, Ocular Trauma Score, Relative Afferent Pupillary Defect.

## **Introduction**

Ocular trauma is a major cause of preventable blindness and

visual impairment in the world. Despite its public health importance, there is relatively less data on magnitude and risk factors for ocular trauma, especially from developing countries. The eyes are the third most common organs affected by injuries, next to the hands and feet, despite the fact that they represent only 0.27% of the total body area and 4% of the facial area<sup>1</sup>.

Most of the eye injuries have a direct relation with the specific occupation and the nature of activity at the time of injury <sup>2,3</sup>. Risk factors of incurring ocular trauma are more in males<sup>4</sup>. This study was undertaken to provide information on the prevalence and pattern of ocular injuries in patients admitted in department of Community Ophthalmology, Sheri-i-Kashmir Institute of Medical Sciences, Srinagar (J&K), India and to determine the cause and pattern of such injuries. During this one year research period Kashmir witnessed a severe uprising against Indian armed and paramilitary forces. This information will help in the development of appropriate preventive measures. However, reform of the firearm laws is probably the best way of prevention.

## **Methodology**

This Hospital -based cross-sectional epidemiological study was conducted at department of Community Ophthalmology, Sheri-i-kashmir Institute of Medical Sciences, Srinagar, for a period of one year from January to December 2012. The eye department serves as a major referral centre for emergency and specialized eye care in Srinagar and its surrounding smaller towns and villages. The study was registered with the institutional review board and was approved by the ethical committee. 98 patients who received different types of eye injuries were assessed and admitted in the hospital and managed accordingly. Consent was taken from all the patients who were enrolled in this study. Patient data's was noted, which included parameters like age, sex, address, cause and

place of injury, duration and activity at the time of injury. Other clinical data's obtained were visual acuity at the time of admission, level of hyphema, and details based on the findings at slit lamp microscopy, intraocular pressure, direct and indirect ophthalmoscopy. Injuries were classified according to BETT <sup>5</sup>(The Birmingham Eye Trauma Terminology) and System for classifying ocular injuries<sup>6</sup>. Ocular Trauma Score (OTS)<sup>7</sup> was calculated in order to estimate the information about visual expectations following the ocular injury.

## Results

A total of 98 patients (105 eyes) were admitted during the 5 month period. Number of male patients (88) admitted outnumbered female patients (10). 45 patients (45.91%) belonged to urban areas whereas 53 patients (54.08%) were from rural places. Maximum number of patients (76) reported in the hospital within 12 hours of injury and the rest (22) within 24 hours of injury. The right eye was involved in 48 (48.97%) subjects, the left eye in 43 (43.87%) patients and the injury was bilateral in 07 (7.14%) cases.

In our study it was revealed that out of the total subjects, majority (61.22%) were of the age group (21-30 years), followed by 11-20 (20.40%) and 31-40 (18.36%) years age respectively (Table 1).

Age in years	No of patients	Percentage (%)
11-20	20	20.40
21-30	60	61.22
31-40	18	18.36
<b>Total</b>	<b>98</b>	<b>100</b>

**Table 1: Age distribution of study participants**

**Table 2** shows that the initial visual acuity was found to be between 1/200-19/200 in 33 eyes of patients (31.42%) followed by Light perception to Hand motion vision in 30 eyes of patients

(28.57%). No light perception was seen in 09 eyes of patients (8.57%).

Presenting visual acuity	No of eyes of patients	Percentage (%)
No light perception	09	8.57
Light perception to Hand motions vision	30	28.57
1/200-19/200	33	31.42
20/200-20-50	16	15.23
≥20/40	17	16.19
<b>Total</b>	<b>105</b>	<b>100</b>

**Table 2: Initial visual acuity of the study participants**

**Table 3 [a, b, c, d]** describes the System for Classifying Ocular Injuries (both Open and Closed Globe injuries) in the patients admitted. **Table 3 (a)** shows Open Globe injuries were caused mostly by pellets (41.30%) (Type C> Type D> Type B) followed by stones during stone pelting (21.73%) (Type B). Occupational and domestic work related open globe injuries amounted to 17.39% of eyes of patients. Further it shows Closed Globe injuries were frequently caused by stones during stone pelting (30.50%) (Type A) followed by occupational and domestic work associated (25.42%) (Type A> Type D). **Table 3 (b)** indicates Open Globe injuries presented in Grade D (43.47%) > Grade C (30.43%) whereas Closed Globe injuries presented in Grade D (27.11%) followed by Grade A> Grade B> Grade C. **Table 3 (c)** shows RAPD positive in 10 (21.73%) and 05 (8.4%) eyes of the patients of Open and Closed Globe injuries respectively. **Table 3 (d)** illustrates Open Globe injuries are mostly located in Zone II (41.30%) followed by Zone I (36.95%) whereas Closed Globe injuries are frequently located in Zone I (50.84%) followed by Zone II (32.20%).

**Table 3: System for Classifying Ocular Injuries (Open and Closed Globe)**

Type (mechanism of injury)	Stones (stone pelting)	Pellets	Rubber bullet	Tear gas shell	Gun butt	Sticks (mob control)	Marble sling shot	Occupational and domestic work
<b>Open globe injuries</b>								
Rupture	02	-	01	01	-	-	01	-
Penetrating	07	04	01	01	-	-	02	05
Intraocular Foreign Body	-	10	-	-	-	-	-	-
Perforating	-	05	-	-	-	-	-	01
Combined	01	-	01	-	-	-	01	02
<b>Total (T1)</b>	<b>10</b>	<b>19</b>	<b>03</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>04</b>	<b>08</b>
<b>closed globe injuries</b>								
Contusion	14	01	03	01	02	05	02	09
Lamellar Laceration	02	-	-	-	-	02	-	02
Superficial Foreign Body	-	-	-	-	-	-	-	-
Mixed	02	-	-	06	02	02	-	04
<b>Total (T2)</b>	<b>18</b>	<b>01</b>	<b>03</b>	<b>07</b>	<b>04</b>	<b>09</b>	<b>02</b>	<b>15</b>
<b>Grand Total T= (T1 +T2)</b>	<b>28</b>	<b>20</b>	<b>06</b>	<b>09</b>	<b>04</b>	<b>09</b>	<b>06</b>	<b>23</b>

**Table 3 (a): Type (Mechanism of injury)**

GRADE (Presenting visual acuity)	OPEN GLOBE INJURIES		CLOSED GLOBE INJURIES	
	No of eyes of patients	Percentage (%)	No of eyes of patients	Percentage (%)
≥20/40	02	4.34	15	25.42
20/50-20/100	02	4.34	14	23.72
19/100-5/200	14	30.43	13	22.03
4/200-Light Perception	20	43.47	16	27.11
No Light Perception	08	17.39	01	1.69
<b>Total</b>	<b>46</b>	<b>100</b>	<b>59</b>	<b>100</b>

**Table 3 (b): Grade (Presenting visual acuity)**

PUPIL (Relative Afferent Pupillary Defect,)	Open globe injuries		Closed globe injuries	
	No of eyes of patients	Percentage (%)	No of eyes of patients	Percentage (%)
A. Positive (RAPD Present)	10	21.73	05	8.47
B. Negative (RAPD Absent)	36	78.26	54	91.52
<b>Total</b>	<b>46</b>	<b>100</b>	<b>59</b>	<b>100</b>

**Table 3 (c): Pupil status**

<b>ZONE (Location of wound)</b>	<b>No of eyes of patients</b>	<b>Percentage (%)</b>
<b>Open globe injuries</b>		
Cornea	17	36.95
Limbus to 5mm posterior into sclera	19	41.30
Posterior to 5mm from limbus	10	21.73
<b>Total</b>	<b>46</b>	<b>100</b>
<b>Closed globe injuries</b>		
External	30	50.84
Anterior Segment	19	32.20
Posterior Segment	10	16.94
<b>Total</b>	<b>59</b>	<b>100</b>

**Table 3(d): Zone (location of wound)**

**Table 4** demonstrates Ocular Trauma Score (OTS). OTS of 3 is seen in 59 eyes of patients (56.19%) and OTS of 1 in 4eyes of patients (3.80%).

<b>OCULAR TRAUMA SCORE (OTS)</b>	<b>No of eyes of patients</b>	<b>Percentage (%)</b>
1	04	3.80
2	09	8.57
3	59	56.19
4	16	15.23
5	17	16.19
<b>Total</b>	<b>105</b>	<b>100</b>

**Table 4: Ocular Trauma Score (OTS)**

## **Discussion**

The study was conducted from January to December 2012. During this time Kashmir witnessed a mass uprising and violent demonstrations against army and paramilitary forces. Stones, sticks, gun butts, marble sling shots, tear gases, rubber bullets and pellet guns were used to quell the protestors, leading to multiple ocular and other injuries.

98 patients (with 105 eyes) were admitted in the eye

wards of our hospital. As reported by other studies<sup>3, 8, 9, 10</sup> there was a preponderance of male subjects, though in our study the proportion of male cases was much higher than reported in the above studies. The dominance of ocular injuries in the male patients (89.79%) is related to the mass participation of males in the protests and active involvement by virtue of stone pelting on the armed forces. Out of 10 female patients admitted, 7 were admitted in the month of May, when there was no uprising. The remaining numbers of females were injured accidentally during the clashes. Since uprising was spread to the whole Kashmir, both urban as well as rural people participated in the protests almost equally. 77.55% patients reported in the hospital within 12 hours of the injury, the remaining 22.44% reported within 24 hours of injury. This may be related to the fact that patients belonging to far flung areas couldn't reach hospital immediately as public transport and ambulances couldn't function properly due to the violent clashes. This is in disparity with the finding of Qureshi et al<sup>11</sup> and Babar et al<sup>12</sup>; where majority of the patients presented 24hours after eye injury. There was a slight predominance of injury to the right eye (48.97%) in this study. This finding is in accordance with the one reported by Mallika et al<sup>13</sup> and Charles et al<sup>14</sup> where around 46% patients had right eye involvement. The reason may be the fact that most people are right handed. Bilateral involvement of eyes was seen in 7.14% cases. The bilateral involvement is slightly more than as reported by Khan et al<sup>15</sup>.

As reported by other studies<sup>3, 10</sup>, most of the patients belonged to young adult age group (48.97%). This can be related to the fact that participation of young adults in the protests was overwhelming and were likely to engage in the aggressive and violent activities like stone pelting. Higher number of admissions in the month of September (33.67%) is suggested by the fact that most of the pellet injury patients were admitted in the same month. Probably more strict measures were taken to control the protestors during the concluding month of the

uprising.

Since people took to streets during the protests, the place of injury was on the streets in 76.53% patients followed by home accidents (9.1%). Our finding is highly in contrast to the study by Mallika et al<sup>13</sup> and Desai et al<sup>16</sup> who showed that home is the most frequent place of ocular injury. The cause of injury was predominantly due to stones (28.57%) acquired while pelting stones on army and the paramilitary forces. This finding may be attributed to the fact that the population under study underwent a transition from guns to the stones as mark of protest and resistance. The culture of using stones as a weapon of resistance against the occupying forces dates from the Palestinians<sup>17</sup>. The other causes of unrest related injuries were due to Pellets (15.30%), Sticks (9.18%) that were being used at times for mob control, Tear Gas shells (7.14%), Rubber bullets and marble sling shots with equal frequencies of 6.12%, gun butt (4%). All the cases that had bilateral eye injuries (7.14%) were due to pellets and tear gas shells. Thought most of the countries don't use live and non live rounds and other weapons during the civil unrest but various countries do use them under some specific legislative guidelines, most important of them being that even at the safe distance they are not to be fired at the level of head. In our study all the cases had sustained injuries when shot above chest.

In our study, turmoil related injuries amounted to 77% of the total ocular injuries and the rest were due to stone chips (5.1%) at the time of work, cow horn (4%), iron/steel rods (2%) and others (12.2%) which included assault injuries, sports related injuries, injuries due to knife, toys. The very low occurrence of school and sports injuries suggests the frequent shut down of schools and playgrounds during the curfews and the active participation of the children and young adults in stone pelting on streets.

In the present study frequency of the patients with Closed Globe injuries (56.19%) was more than Open Globe

injuries (43.80%). Our analysis showed slightly higher incidence of Open Globe injuries as compared to the study by Karaman et al<sup>18</sup>. Open Globe injuries were mostly due to Pellets (41.30%) and Stones, while pelting stones (21.73%) causing Type B, Type C and Type D injuries mostly. 82.60% of Open Globe injuries were related to the turmoil. Presenting visual acuity was mostly in Grade D (43.47%). Grade E, No light perception was seen in 17.39% of the Open Globe injuries, thus indicating worse visual prognosis. Injuries were located posterior to cornea in 63.04% patients (Zone II and Zone III).

Majority of the Closed Globe injuries were due to Stones (stone pelting) (30.50%) followed by occupational and domestic work related (25.42%) causing Type A and Type D injuries mostly. 74.57% injuries were related to stone pelting directly or indirectly. Initial visual acuity was diffusely seen from Grade D to Grade A. Presenting visual acuity  $\geq 20/40$  i.e. Grade A was seen in 25.42% cases. Most of the Closed Globe injuries belonged to Zone I (50.84%) and Zone II (32.20%). OTS<sup>7</sup> of 3 was seen in majority of the patients (56.19%) signifying that the final visual acuity of  $\geq 20/40$  is possibly in 41% of the patients. OTS of 5 was noted in 16.19% eyes, indicating final visual acuity of  $\geq 20/40$  in 94% subjects. 4 cases (3.80%) had OTS 1 meaning final visual acuity of  $\geq 20/40$  in just 1% patients.

## **Conclusion**

It is worrying that none of admitted patients utilized protective devices at the time of injury, despite being involved in a high risk activity. Prevention of blunt eye injuries requires education of children and their care givers on the potential dangers of stone pelting. This study also signifies the need for educating people regarding the use of protective eyewear which may significantly decrease the magnitude of visual loss due to trauma. Simple measures such as education, enforcement of legislation and campaign against the use of undemocratic

means of controlling protests by police could reduce these severe ocular injuries in the communities affected. Even under dire circumstances, the use of the weapons should not be subjective at all and the rules laid down in this respect should be duly honoured.

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