

Factors associated with final visual outcome in traumatic hyphema

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ABSTRACT

Introduction: Hyphema is the accumulation of blood in anterior chamber of the eye that can directly affect our vision. Various factors play role in final visual outcome among patients with hyphema, and there are very few related studies. Therefore, this study aimed to determine the factors related to final visual outcome among patients with traumatic hyphema. **Methods:** This cross-sectional study was conducted among 62 cases of traumatic hyphema presenting to the emergency department of Tribhuvan University Teaching Hospital and outpatient department of Bisheshwar Prasad Koirala Lions Centre for Ophthalmic Studies from July 2018 to July 2019. A detailed clinical history was obtained, followed by an ophthalmic examination and relevant investigation. Data was analysed using descriptive and inferential statistics at 5% level of significance using IBM statistical package for the social sciences. **Results:** Projectile (54.8%) and fall injury (12.5%) were the most common mode and causes of trauma, respectively. The best visual acuity of the involved eye at presentation was 6/9 (6.5%), and the worst was non-perception of light (3.2%). At presentation, the most common grade of hyphema was grade I (48.4%), and the least common was microhyphema (6.5%). Grades of hyphema ($p=0.014$) were significantly associated with the final visual outcome. Anterior segment findings such as of lid ($p<0.001$) and lens ($p=0.014$) and posterior segment findings such as of vitreous ($p<0.001$) and retina ($p=0.048$) were also significantly associated with final visual acuity. **Conclusions:** For the most optimal visual outcome in traumatic hyphema, all associated periocular and intraocular findings must be prioritized and addressed accordingly.

Keywords: Closed globe, hyphema, injury, traumatic, visual outcome.

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INTRODUCTION

Hyphema is “the accumulation of blood within the eye’s anterior chamber”.¹ Accumulation of blood in this region occurs due to disruption of vessels of the iris or ciliary body, usually due to trauma.²

Traumatic hyphema is found in every 12 out of 100,000, with peak incidence occurring in children.³ About 70% of the cases are seen in children, mostly males between the age of 10 years to 20 years.³ The injury is usually related to sports in the case of children. In contrast, adolescents and adults are more likely to be injured by a high-energy blow to the eye, such as assault, paintball guns, airsoft guns and airbag deployment.⁴

According to the national population-based survey (1981), the blindness prevalence rate was 0.84% in Nepal, with trauma responsible for 7.9% of monocular blindness. Studies have shown that traumatic hyphema due to blunt injury is associated with an increased risk of compromised visual function, even though ocular trauma is one of the most important preventable causes of blindness.⁵⁻⁷ Recognition of factors related to poor final visual outcome may be helpful to reduce this complication associated with traumatic hyphema. Lens opacity, choroidal rupture, angle recession, glaucoma, and retinal detachment are causes of poor vision after

blunt injury.⁸ However, the relative importance of these factors in determining the final visual outcome following traumatic hyphema has not been well established. Early recognition of these factors, appropriate treatment and careful follow-up could help improve the final visual acuity. Thus, this study aims to determine the factors related to the final visual outcome in traumatic hyphema.

METHODS

A cross-sectional study was conducted among 62 cases of traumatic hyphema due to blunt injury presenting to the Emergency Department of Tribhuvan University Teaching Hospital (TUTH) and Outpatient Department of Bisheshwar Prasad Koirala Lions Centre for Ophthalmic Studies (BPKLCOS), Maharajgunj Medical College, Institute of Medicine, Kathmandu, Nepal from July 2018 to July 2019. Ethical clearance for the study was obtained from the Institute of Medicine's Institutional Review Committee (IRC) (Ref no: 237(6-11-E)6[^]2/874/075). The study included all cases of traumatic hyphema due to blunt injury presenting to the emergency department of TUTH and outpatient department of BPKLCOS during the study period. Hyphema associated with a bleeding disorder, intraocular surgery, systemic and ocular diseases and open globe injury were excluded from the study. A detailed history was followed with the ocular examination that included: visual acuity, grading of hyphema, intraocular pressure measurement, and as needed and possible gonioscopy, B-scan, Ocular Computed Tomography (OCT), X-ray, Complete Blood Count (CBC), Bleeding Time (BT), Clotting Time (CT) were performed. The patient was treated or admitted as per requirement and compliance. Resolution of hyphema, rebleeding as well as visual acuity, intra-ocular pressure (IOP), gonioscopy, and clinical photography was made on week 1, week 4, and week 6, whichever was required and feasible.

To measure the association of various variables with final visual acuity, the subjects were divided into two groups. Group 1 consisted of subjects with final visual acuity of 6/12 or better whereas group 2 consisted of subjects with final visual acuity of 6/18 or worse.¹² Since the individual grades of hyphema consisted of very few subjects, the groups were merged for statistical analysis. Microhyphema, grade I and grade II were combined as one group and grade III and grade IV were combined as next group. Fischer's exact test was applied for analysis since more than 20% of cells had an expected count of less than five. The p value of <0.05 was considered statistically significant.

RESULTS

The present study comprised 62 patients, of which 50

(80.6%) were males, and 12(19.4%) were females. Their mean age was 27.98 years. The majority of patients, 21(33.9%), were 11 to 20 years old. All the patients had unilateral ocular involvement, with the right eye being more commonly involved (53.2%) than the left eye (46.8%). Most injuries were due to projectile objects (54.8%), followed by blows (32.3%). The injury mainly occurred at home (53.2%) and the majority of the patients (35.5%) presented on the first day of injury. Fall injury (12.5%) was found to be the most common cause of trauma, followed by injury from coke bottle cap (9.7%) (Table 1).

Table 1: Demographic data and distribution of subjects in the study (n=62)

Variables	Frequency (%)
Gender	
Male	50 (80.6)
Female	12 (19.4)
Age group	
1-10	5 (8.1)
11-20	21 (33.9)
21-30	19 (30.6)
31-40	3 (4.8)
41-50	7 (11.3)
>50	7(11.3)
Eye involved	
Right eye	33 (53.2)
Left eye	29 (46.8)
Mode of trauma	
Projectile	34 (54.8)
Blow	20 (32.3)
RTA/Fall	8 (12.9)
Place of trauma	
Home	33 (53.2)
Away from Home [#]	29 (46.77)
Day of presentation	
1	22 (35.5)
2	20 (32.3)
3	3 (4.8)
4	10 (16.1)
≥5	7(11.3)
Cause of trauma	
Fall injury	8 (12.9)
Coke bottle cap	6 (9.6)
Stone	5 (8)
Others [*]	43 (69.3)

[#]Away from home: Office, school, cafe, college, road, playground

^{*}Others: Wooden stick, tv remote, thread roll, syringe, stapler pin, shuttle cork, rubber band, pillar injury, physical assault, ox horn, nail, hand, fruit, fist blow, door strike, door knob, cricket ball, cow tail, cooker blast.

Figure 1 shows the distribution of subjects based on initial visual acuity of the involved eye. Most of the patients (22.6%) presented with visual acuity of 6/36. The best visual acuity at presentation was 6/9 among 6.5%, and the worst was non perception of light (NPL) among 3.2% of the patients.

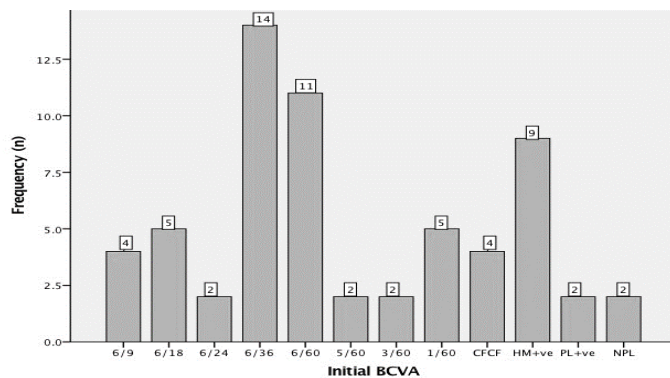


Figure 1: Bar diagram showing the distribution of subjects based on initial visual acuity of the involved eye

Figure 2 shows the distribution of subjects based on final visual acuity of the involved eye. In most of the patients (45.2%), the final visual acuity of the involved eye was recorded as 6/6, followed by 6/9 among 22.6%. There was no improvement in visual acuity in two patients (3.2%) with non-perception of light (NPL).

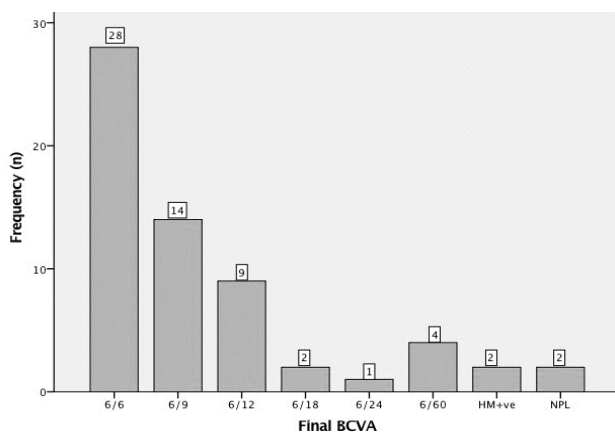


Figure 2: Bar diagram showing the distribution of subjects based on final visual acuity of the involved eye

Table 2 shows the distribution of grades of hyphema among the respondents. Nearly half of the patients (48.4%) presented with grade I hyphema and microhyphema was present among the least number of patients (6.5%) (Table 2).

Table 2: Frequency distribution of subjects according to grades of hyphema

Grades of Hyphema	Frequency	Percentage
Microhyphema	4	6.5
Grade I	30	48.4
Grade II	12	19.4
Grade III	9	14.5
Grade IV	7	11.3

The association between hyphema grades and final visual acuity were evaluated through Fischer’s exact test, which

showed statistically significant differences between the groups (p=0.014). The association between anterior and posterior segment findings and final visual acuity were also evaluated using the same test. The differences were statistically significant in the lid (p<0.001), lens (p=0.014), vitreous (p<0.001) and retina (p=0.048) (Table 3).

Table 3: Association of hyphema and various ocular and periocular injuries with final visual acuity

Variables	Group 1 N (%)	Group 2 N (%)	p-value
Hyphema			
Microhyphema, Grade I, Grade II	42 (80.8)	4 (40)	0.014*
Grade III & IV	10 (19.2)	6 (60)	
Lid			
Normal	42 (80.8)	1 (10)	<0.001*
Contusion, Laceration & Edema	10 (19.2)	9(90)	
Conjunctiva			
Normal	26 (50)	6 (60)	0.733
Subconjunctival hemorrhage & Congestion	26 (50)	4 (40)	
Iris			
Normal	13 (25)	5 (50)	1.37
Sphincter tear & Iridodialysis	39 (75)	5 (50)	
Cornea			
Normal	50 (96.2)	10 (100)	1.00
Epithelial defect	2 (3.8)	0 (0)	
Pupil			
Round, regular, reactive	38 (73.1)	6(60)	0.457
Irregular, Traumatic mydriasis	14 (26.9)	4(40)	
Lens			
Normal	42 (80.76)	4 (40)	0.014*
Cataractous, Subluxated, Dislocated & Vossius ring	10 (19.23)	6 (60)	
Vitreous			
Clear	50 (96.2)	4 (40)	<0.001*
Hemorrhage, opacities	2 (3.8)	6 (60)	
Retina			
Normal	49 (94.2)	7 (70)	0.048*
Detachment, Commotio-retinae and pre-retinal hemorrhage	3 (5.8)	3 (30)	
Choroid			
Normal	52 (100)	9 (90)	0.161
Hemorrhage with thickening	0(0)	1 (10)	

*Statistically significant

Out of 62 patients, 5 (8.1%) patients showed complications of traumatic hyphema. In all five cases, rebleeding was the associated complication which was seen on the second day in one patient, on the third day in two patients and on the fourth day in two patients.

DISCUSSION

Eye injuries are the third most common injuries occurring due to trauma after hand injuries and feet injuries.⁹ It is still considered the most common cause of unilateral blindness worldwide. Traumatic hyphema occurs mostly as a result of blunt eye injuries.¹⁰ Two-thirds of traumatic hyphema cases are due to blunt ocular trauma, and one-third are due to traumatic rupture of the globe.⁵ The complications associated with hyphema and the concomitant injuries to ocular structures are considered the vision-threatening sequelae of blunt trauma.⁵ In our present study, we have

tried to recognize the factors related to the final visual outcome in the case of traumatic hyphema. A total of 62 patients clinically diagnosed with traumatic hyphema were included. The mean age of the patients in the study was 27.98 ± 15.85 years. Most of them were males (80.6%) and belonged to the age group of 11 to 20 years, which agrees with several other studies reported in the literature.^{11,12} This may be because males are engaged in more violent activities than females, and sports-related injuries are more common in ages below 20 years.¹²

In our present study, we have tried to recognize the factors related to the final visual outcome in the case of traumatic hyphema. A total of 62 patients clinically diagnosed with traumatic hyphema were included. The mean age of the patients in the study was 27.98 ± 15.85 years. Most of them were males (80.6%) and belonged to the age group of 11 to 20 years, which agrees with several other studies reported in the literature.^{11,12} This may be because males are engaged in more violent activities than females, and sports-related injuries are more common in ages below 20 years.¹²

All the patients in our study had unilateral ocular involvement, with the right eye more commonly involved than the left eye. This result is similar to Ulagantheran et al.¹³ We observed that the most common trauma mode was projectile followed by blow. However, Cho et al. found a blow the most common mode of injury, with projectile being the second most common.¹² Our study showed home as the most common place of injury, followed by school and office. One of the studies involving 472 cases of traumatic hyphema has also reported home as the single most frequent place of injury.¹⁰ This may reflect the amount of time spent in these locations. Our data also showed that the most common cause of trauma was fall injury. One of the reasons for this could be a sports-related injury which is more common among teenagers, and the majority of patients in our study were from this group. Most of the patients in our study presented within 24 hours of the injury, following the findings of Mela et al.¹⁴ This suggests that people are conscious of the sudden diminution of vision. The other reason for this could be the easy access to health care centers. It has been suggested that the final visual outcome is better in patients who receive treatment within 24 hours after injury.⁵

Most of the patients in this study presented with grade I hyphema, followed by grade II and III. One similar study from Qatar also reported that most patients had grade I hyphema followed by grade II.¹⁵ There have been opinions regarding the association between grades of hyphema and final visual outcome. Read and Goldberg suggested that, in

about 10% of patients, the poor visual outcome is directly linked to grades of hyphema.¹⁶ Ng et al., in their review involving 425 cases of traumatic hyphema, found poor final visual outcomes in patients with large hyphema.¹¹ In contrast to these studies, Al Ali et al. and Rahmani et al. could not establish a significant association between the final visual outcome and the size of hyphema.^{15,17} However, in the present study, similar to Ng et al.¹¹, we also found a significant association between final visual outcome and grades of hyphema ($p=0.014$). In the present study, we observed that anterior segment findings such as lid, and lens were significantly associated with final visual acuity which was similar to the findings of Cho et al.¹²

In traumatic hyphema, posterior segment injuries have been considered in the literature concerning final visual acuity. The findings of our study suggested that posterior chamber findings such as vitreous and retina were significantly associated with final visual acuity. This finding is in agreement with the findings of several other authors.^{12,13,15} In a study done by Ng et al., almost all the patients with worse visual outcomes had incurred retinal damage. They have further mentioned that, though this may not be visible at the time of initial examination through the hyphema, retinal damage is confirmed as an important contributor to worse final visual outcome following traumatic hyphema.¹¹ Talmon et al. have mentioned retinal tear or detachment as the most frequent injury responsible for visual outcome.¹⁵

Several complications are associated with traumatic hyphema, such as rebleeding, secondary glaucoma, corneal blood staining, and optic atrophy. However, rebleeding was the only complication in our study and very few patients presented with this complication. Studies have shown that the rate of rebleeding is comparatively lower in the Asian population compared to the American population, especially African Americans. This conclusion has been attributed to racial differences in the melanin content of the iris as melanin prolongs the resorption of blood, thereby affecting the rate of rebleeding.^{15,18}

Thus, in the present study, we observed that the final visual outcome in patients with traumatic hyphema is associated with various factors. Anterior segment findings such as lid and lens are significantly associated with the final visual outcome. There was no direct relationship between final visual acuity and anterior segment findings. Nevertheless, these findings may reflect severe injuries (both anterior and posterior) with more frequent concurrent posterior segment injuries.¹² Similarly, posterior segment findings such as vitreous and retina are also significantly associated with the final vision. As in the anterior segment, these

findings could also result from concurrent findings in the anterior segment.

Based on our observations and previous reports, researchers suggest that the earlier factors should be paramount when determining the appropriate medical therapy and surgical interventions in patients with traumatic hyphema. However, further studies with many samples need to validate our preliminary observations.

CONCLUSIONS

The final visual outcome in patients with traumatic hyphema is associated with various factors. In addition to grade of hyphema, posterior segment findings such as of vitreous and retina along with anterior segment findings such as of lid and lens, are significantly associated with the final visual outcome. For the most optimal visual outcome in traumatic hyphema, all associated periocular and intraocular findings must be prioritized and addressed accordingly.

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CONFLICTS OF INTEREST: None declared

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