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Evaluating Intraocular Pressure Outcomes Following Ocular Contusion

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Abstract **Original Research Article**

Background: Ocular contusions, often resulting from sports-related injuries and falls, present a significant public health concern. This study aims to evaluate the demographic distribution, causes, intraocular pressure (IOP) outcomes, and complications following ocular contusions at the National Institute of Ophthalmology & Hospital in Bangladesh. ***Methods:*** This retrospective observational study involved a sample of 50 patients who presented with ocular contusions over a six-month period. Data were collected on patient demographics, the cause of injury, IOP readings, and subsequent complications. The study focused on identifying patterns in age and gender distribution, the prevalence of different causes of contusions, variations in IOP, and the incidence of common ocular complications. ***Results:*** The majority of the patients were male (64%), with a notable prevalence of injuries among children aged ≤10 years (44%). Sports-related injuries emerged as the most common cause (48%), followed by falls (26%). A significant proportion of patients (66%) exhibited elevated IOP levels post-injury. The most frequent complications included hyphemia (40%), conjunctival hemorrhage (36%), and corneal abrasion (28%). Notably, glaucoma was a less common but present complication. ***Conclusion:*** The study highlights the predominance of sports-related ocular injuries in a young population and the commonality of elevated IOP following such traumas. These findings emphasize the need for targeted preventive strategies and heightened awareness about ocular safety in younger demographics, particularly in the context of sports activities.

Keywords: Ocular contusion, intraocular pressure, sports-related eye injuries, pediatric ocular trauma, ocular complications.

INTRODUCTION

Ocular contusions, resulting from blunt trauma to the eye, are a significant concern in ophthalmic emergencies. Their impact on intraocular pressure (IOP), a crucial parameter in ocular health, is not fully understood, particularly in regions like Bangladesh. Worldwide, the prevalence of ocular contusions underscores a major public health issue, with varying incidences reported in different demographics [1,2]. These contusions typically result from accidents, sports injuries, and occupational hazards. Studies have shown that demographics most affected are often engaged in manual labor or live in areas with higher incidences of physical confrontations [3,4]. The frequent occurrence of these injuries in certain populations necessitates focused preventive measures and heightened awareness. Pathophysiologically, ocular contusions can lead to a range of changes in the eye, including anterior chamber angle alterations and IOP disturbances [5]. These injuries can lead to conditions like hyphema, angle recession, or traumatic cataract, complicating the clinical picture [6,7]. The dynamics of IOP, vital for maintaining the structural integrity of the eye, are significantly affected post-contusion. The balance between aqueous humor production and drainage, which dictates IOP, can be disrupted by trauma [8]. IOP fluctuations following contusion can display patterns of initial hypertension followed by hypotension, with some cases progressing to long-term complications like secondary glaucoma [2,9]. Research shows that while an initial IOP rise post-trauma is common, the development of secondary glaucoma is relatively rare but crucial to monitor [10]. Factors such as hyphema post-contusion significantly influence IOP management [11]. Thus, continuous monitoring in patients with ocular contusions is essential due to the unpredictable nature of IOP changes [4]. In contexts like Bangladesh, where specific epidemiological data may be limited, studies in similar demographics provide valuable insights. For instance, studies in other developing regions have shown notable incidences of

ocular injuries and their impact on IOP [6, 7]. These insights are crucial for formulating region-specific clinical guidelines and preventive strategies. The current research can contribute significantly to the existing literature and inform healthcare policies and practices, leading to improved patient outcomes. Furthermore, understanding the patterns and implications of ocular contusions in this context can aid in resource allocation and healthcare planning.

METHODS

This retrospective observational study was conducted at the Department of Ophthalmology, National Institute of Ophthalmology & Hospital, Bangladesh. The study duration was 6 months, from July 2023 to December 2023, focusing specifically on cases treated within this time frame. The study cohort comprised a sample size of 50 patients, chosen based on the completeness and relevance of their hospital records. Only those hospital records that provided a comprehensive account of the patient's diagnosis, treatment, and follow-up for ocular contusion were included. Any hospital records that were incomplete or did not meet the inclusion criteria were excluded from the study. The inclusion criteria for the study were clearly defined: patients must have been diagnosed with an ocular contusion, treated at the National Institute of Ophthalmology & Hospital during the specified 6-month period. Records were thoroughly reviewed to ensure that the data included relevant information such as patient demographics, the specifics of the ocular contusion incident, clinical findings at presentation, intraocular pressure (IOP) readings taken post-injury, treatment administered, and any complications or additional interventions that occurred. The objective of the study was to observe and analyze the patterns and outcomes of IOP changes in patients following an ocular contusion. This involved examining the variations in IOP from the time of initial presentation through the course of treatment. The study sought to establish any correlations between the severity of the contusion, the treatment methods employed, and the resultant IOP outcomes. Ethical considerations were rigorously observed in line with the Helsinki Declaration. Given the retrospective nature of the study, the requirement for individual patient consent was waived. However, strict confidentiality was maintained, with all patient information being anonymized and used solely for the purpose of this research.

RESULTS

Table 1: Age distribution of the participants (N=50)

Age	Frequency	Percentage
≤10	22	44%
11-20	16	32%
21-30	6	12%
31-40	6	12%

Individuals aged 10 years or younger represented the largest age group, constituting 44% (22 individuals) of the study population. The next significant age group was those between 11 to 20 years, making up 32% (16 individuals) of the participants. Both of the age groups 21 to 30 years and 31 to 40 years shared equal representation in the study, each consisting of 12% (6 individuals) of the total participant count.

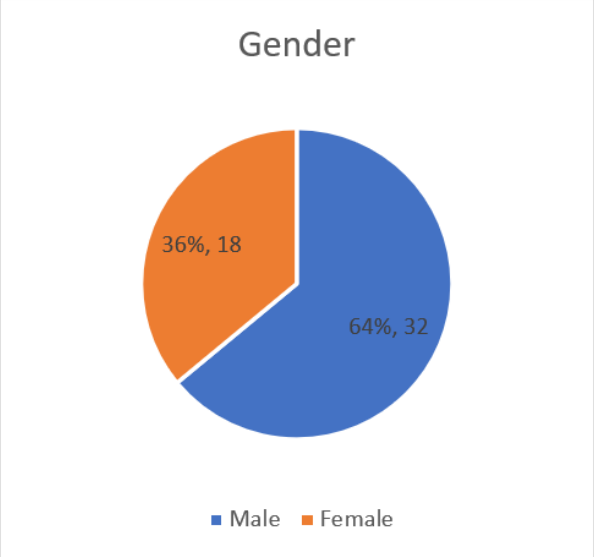

Figure 1: Gender distribution of the participants (N=50)

Gender distribution among the 50 participants showed a predominance of male subjects, accounting for 64% (32 individuals), while female subjects comprised 36% (18 individuals)

Table 2: Distribution of participants by injury related characteristics (N=50)

Characteristics	Frequency	Percentage
Type of Injury		
Closed Globe Injury	42	84%
Open Globe Injury	8	16%
Site of Impact		
Right Eye	27	54%
Left Eye	20	40%
Both Eyes	3	6%

Among the 50 individuals evaluated, the majority sustained closed globe injuries, which accounted for 84% (42 individuals) of the cases. In contrast, open globe injuries were less common, constituting 16% (8 individuals) of the injuries reported. In terms of the site of impact, injuries to the right eye were the most frequent, with 54% (27 individuals) of participants affected on this side. Left eye injuries were also significant, affecting 40% (20 individuals) of the cohort. Bilateral injuries, where both eyes were impacted, were the least common, observed in 6% (3 individuals) of the cases presented.

Table 3: Distribution of participants by cause of ocular contusion (N=50)

Cause of Contusion	Frequency	Percentage
Fall	13	26%
Sports Injury	24	48%
Assault	9	18%
Traffic Accident	4	8%

Sports-related injuries were the most prevalent cause, representing nearly half of the cases at 48% (24 individuals). Falls were the second leading cause, accounting for 26% (13 individuals) of the ocular contusions. Assaults were also a notable cause, contributing to 18% (9 individuals) of the injuries. Traffic accidents were identified as the least common cause, comprising 8% (4 individuals) of the cases of ocular contusion within the study population.

Table 4: Distribution of intraocular pressure among the participants (N=50)

IOP	Frequency	Percentage
Normal (10-20 mmHg)	17	34%
Elevated (>21 mmHg)	33	66%

The distribution of intraocular pressure (IOP) among the 50 participants in the study indicated a significant finding: a majority of individuals exhibited elevated IOP levels. Specifically, 66% (33 individuals) had an IOP greater than 21 mmHg. Conversely, 34% (17 individuals) of the participants had IOP within the normal range, defined as 10-20 mmHg.

Table 5: Distribution of complications resulting from contusion among the participants (N=50)

Complications	Frequency	Percentage
Hyphemia	20	40%
Corneal Abrasion	14	28%
Conjunctival Hemorrhage	18	36%
Glaucoma	2	4%

Hyphemia, or blood in the anterior chamber of the eye, was observed as the most common complication, affecting 40% (20 individuals) of the cases. Conjunctival hemorrhage, indicative of bleeding underneath the conjunctiva, was also a significant complication, present in 36% (18 individuals) of participants. Corneal abrasion, which is a scratch on the cornea, was noted in 28% (14 individuals) of the cases. Glaucoma was the least frequent complication but still present in the cohort, with 4% (2 individuals) having developed this condition.

DISCUSSION

In the present study conducted at the National Institute of Ophthalmology & Hospital, Bangladesh, we observed a predominance of sports-related injuries as the cause of ocular contusions, accounting for 48% of the cases. This finding is consistent with that of Larrison *et al.,* who reported that sports trauma was a significant cause of ocular morbidity, with basketball, baseball/softball, and racquetball being the leading contributors [12]. The findings of Barr *et al.,* further corroborate these findings, identifying racquet sports and football as common causes of ocular trauma, while also emphasizing the critical role of protective eyewear in prevention [13]. The gender distribution in our study indicated a male predominance (64%), which mirrors the pattern observed by Haring *et al.,* where a majority of sports-related eye injuries occurred in males [14]. This high prevalence of male patients among ocular contusion cases also reflects the findings of recent and older studies, suggesting that regardless of cause of injury, ocular contusion occurs more among male population [15,16]. Furthermore, the distribution of ocular contusion by the site of impact in our study found that the right eye was more commonly affected (54%), consistent with Choi and Shin, who reported similar unilateral eye involvement in leisure sports-related ocular injuries [17]. Concerning the age distribution, the largest affected age group in our study was ≤10 years, comprising 44% of the participants. This significant representation of a younger demographic aligns with the observed high prevalence of falls and sports-related injuries in our cohort. Younger age groups are typically more involved in active play and sports, which may explain their higher susceptibility to such injuries. The age distribution of the current study is somewhat younger than the age distribution reported by Patel *et al.,* who noted that the largest proportion of sports-related ocular injuries occurred in the 12–17 years age cohort [18]. The difference may be attributed to the varied nature of sports and activities in which younger populations engage in different geographical settings. Our study also highlighted the distribution of intraocular pressure (IOP) changes post-ocular contusion, revealing that 66% of patients exhibited elevated IOP levels. The study by Turalba *et al.,* lends support to this observation, as they identified increased age, hyphema, lens injury, and zone II injury as risk factors for developing ocular hypertension after open-globe injury [19]. Furthermore, we found that hyphemia was the most common complication of ocular contusions, affecting 40% of the cases. This is particularly significant when compared to the prevalence of hyphema reported by Varma *et al.,* where a similar significant association was found between ocular trauma and the subsequent development of glaucoma and ocular hypertension [20]. Razeghinejad *et al.,* discuss the various trauma-related mechanisms leading to IOP elevation and their complex management, which aligns with our study's emphasis on the diverse complications following ocular contusions [21]. The current study's findings enrich the existing literature by contributing data from Bangladesh, a region previously underrepresented in ocular trauma research. By comparing the current study's results with the findings from different regions and populations, we can observe

both congruities and disparities that emphasize the global burden of ocular trauma, the nuances in its demographic distribution, and the ensuing complications that necessitate vigilant clinical management and preventive measures.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, our study at the National Institute of Ophthalmology & Hospital, Bangladesh, underscores the significant impact of ocular contusions, particularly in younger populations, with sports-related injuries being a predominant cause. The prevalence of elevated intraocular pressure and the spectrum of complications such as hyphemia, corneal abrasion, and conjunctival hemorrhage highlight the need for increased awareness and preventive strategies in ocular safety. Our findings contribute to the broader understanding of ocular trauma's demographic distribution and clinical outcomes, emphasizing the importance of targeted interventions and protective measures, especially in active younger demographics. This study not only sheds light on the patterns of ocular trauma in a specific geographic setting but also provides valuable insights for global ophthalmic trauma management and prevention strategies.

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