https://doi.org/10.36570/jduhsxxx.x

JDUHS

ORIGINAL ARTICLE

Visual Outcomes and Prognostic Factors Associated With Open-Globe Injuries among the Pakistani Population

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ABSTRACT

Objective: To determine the visual outcomes and prognostic factors associated with open globe-injuries in patients attending Sindh Institute of Ophthalmology and Visual Sciences (SIOVS), Hyderabad, Pakistan.

Methods: A prospective cross-sectional study was conducted at Sindh Institute of Ophthalmology and Visual Sciences (SIOVS), Hyderabad from January 2022 to February 2023. All patients irrespective of age and gender attended the institute with open globe injury were enrolled. Visual outcomes of open-globe injury were recorded as length of wound and lens status. Complications associated with open-globe injury were also noted.

Results: Of 336 patients, the mean age of the patients was 17.6 ± 15.6 years. There were 231 (68.7%) males and 105 (31.3%) females. The most common object of injury was stick/thorn and metal/iron i.e., 117 (34.8%) and 105 (31.3%) respectively. Center of cornea/visual axis involvement was observed in 207 (61.6%) patients. The mean length of the wound was 6.28 ± 3.65 mm. Status of the lens showed an intact lens in 140 (41.7%) patients and traumatic cataract with intact/rupture of capsule in 196 (58.3%) patients. A significant association between the length of the wound and the status of the lens was found with the object of injury (p-value <0.001), and center of cornea/visual axis involvement (p-value <0.001).

Conclusion: In this study, the majority of patients with globe injuries were younger. Object of injury and center of cornea/visual axis involvement were two prognostic factors that were significantly associated with visual outcomes of globe injuries.

Keywords: Injury, Ophthalmology, Prognostic Factors, Visual Outcome.

INTRODUCTION

Globe injury plays a substantial role in causing vision loss.[1,2] The consequences of blindness are twofold, significantly impacting the quality of life and leading to decreased productivity in those affected.[2,3] An open-globe injury is characterized as a complete penetration of the eye wall, which poses a serious threat to vision and frequently results in blindness. Despite significant endeavors to prevent this form of vision loss, it continues to be prevalent worldwide, with an annual global incidence rate of 3.5 per 100,000 individuals.[4]

The proportions of open-globe injury compared to closed-globe injury have been found to vary across different studies.[3,5] Despite the implementation of public health campaigns aimed at preventing eye injuries, open-globe injuries continue to occur at an alarming rate.[6,7]

Open-globe injuries lead to unfavorable visual outcomes and result in significant ocular morbidity and blindness. The sudden and unexpected nature of such injuries can also give rise to psychosocial challenges, permanent alterations in the affected individuals' quality of life, as well as disruptions in their career trajectories and future plans. These issues don't just impact the patients themselves but extend to their family members as well. Despite advancements in medical tools and techniques for ocular surgery, along with increased awareness regarding occupational safety, individuals with open-globe injuries still tend to experience poor visual recovery.[8]

The rationale of the study is that globe injuries are relatively common in Pakistan, with a significant number of cases reported annually. Moreover, many

individuals with globe injuries in Pakistan often present late to healthcare facilities, which can impact the overall prognosis and visual outcomes. Globe injuries have a significant impact on public health, causing visual impairment and disability. Understanding the patterns and outcomes of such injuries in Pakistan is crucial for developing effective preventive strategies and improving patient care. Conducting research in this area can help fill knowledge gaps and provide a better understanding of the burden and characteristics of these injuries in the country. Thus, the current study was conducted to assess the visual outcomes and prognostic factors associated with open-globe injuries among the Pakistani population.

METHODS

A prospective cross-sectional study was conducted at Sindh Institute of Ophthalmology and Visual Sciences (SIOVS), Hyderabad from January 2022 to February 2023. Ethical approval was obtained from the institute prior to conducting the study. Patients were asked to consent, and the purpose of the study was described.

Open Epi sample size calculator was used for the estimation of sample size. The confidence interval was taken as 95%, the margin of error 5%, and the prevalence of fall as reported injury was taken as 32.2%".[9] The estimated sample size came out to be 336. A thorough examination was carried out on the records of all individuals who were considered eligible and had experienced an open-globe injury. All patients irrespective of age and gender attended the institute with open globe injury were enrolled. However, blunt ocular trauma or cases with incomplete medical records were excluded.

Open-globe injury was defined as a full-thickness wound of the eyewall with sharp or pointed objects, intraocular foreign bodies, as well as globe ruptures. Visual outcomes of open globe injury were recorded as length of wound and lens status.

Information on prognostic factors was collected as age, gender, place of injury, time of injury, intent of injury, duration from time of injury to consultation, object of injury, diagnosis, center of cornea/visual Axis involvement, and associated complications. Time of injury was categorized into morning (06:01 am to 12:00 pm), afternoon (12:01-06:00 pm), and evening (06:01 pm to 06:00 am).

Statistical Package for Social Sciences (SPSS) version 24 was used for the purpose of statistical analysis. Mean ± SD were computed for quantitative variables such as age, duration of time for injury to consultant, and length of wound injury. Frequency and percentages computed for qualitative variables such as gender, place of injury, time of injury (morning/afternoon/evening), intent of injury, object of injury, diagnosis, center of cornea/visual axis involvement, lens status, and associated complications. The Chi-Square test was applied to see the association of the visual outcomes of open-globe injury with general and clinical prognostic factors of the patients. The p-value of ≤0.05 was considered significant.

RESULTS

Total 336 patients participated in the study. The mean age of the patients was 17.6 ± 15.6 years. There were 231 (68.7%) males and 105 (31.3%) females. Results showed that home was the place of injury in 195 (58.0%) cases, work/office in 69 (20.5%) cases, and 72 (21.5%) cases reported miscellaneous places of injury. Morning time was reported in the majority of the patients, i.e., 164 (48.8%) followed by afternoon 118 (35.1%), and evening 54 (16.1%). Stick/thorn and metal/iron were the most common objects of injury reported by 117 (34.8%) and 105 (31.3%) participants respectively.

The mean duration from injury to visiting a consultant was 2.96 ± 4.01 days, and the mean length of the wound was 6.28 ± 3.65 mm. Center of cornea/visual axis involvement was observed in 207 (61.6%) patients. The status of the lens showed an intact lens in 140 (41.7%) patients and a traumatic cataract with intact/rupture of the capsule in 196 (58.3%) patients. Corneal laceration was diagnosed in 218 (64.9%) patients, crone-o-scleral laceration in 96 (28.6%) patients, and scleral laceration in 22 (6.5%) patients.

Length of wound > 5 mm was observed in 175 (52.1%) patients. A significant association of length of wound found with the time of injury (p-value <0.001), object of injury (p-value <0.001), and center of cornea/visual axis involvement (p-value <0.001). The status of the lens significantly associated with gender (p-value 0.002), place of injury (p-value <0.001), object of injury (p-value <0.001), center of cornea/visual axis involvement (p-value <0.001), and diagnosis (p-value <0.001). (Table 1)

Increased length of wound found significantly higher in patients who had traumatic cataract with rupture of capsule as compared to intact lens i.e., 128 (73%) vs. 47 (27%) (p-value <0.001). (Figure 1)

Complications were observed in 119 (35.4%) patients. Of these 119 patients with complications, endophthalmitis was the most common condition observed in 37 (33.3%) patients, iris/vitreous prolapse or loss in 31 (27.9%), and phthisis in 19 (17.1%) patients. (Table 2)

Table 1: Association of visual outcome of open globe injury with general and clinical prognostic factors (n=336)

	Length of Wound, mm			Status of Lens		
	≤ 5 (n= 161)	> 5 (n= 175)	p-value	Intact (n= 161)	Traumatic Cataract with Intact/Rupture of Capsule (n= 175)	p-value
Age, years						
≤18	120 (49.8)	121 (50.2)	0.273	94 (39.0)	147 (61.0)	0.140
>18	41 (43.2)	54 (56.8)		46 (48.4)	49 (51.6)	
Gender						
Males	111 (48.1)	120 (51.9)	0.941	83 (35.9)	148 (64.1)	0.002*
Females	50 (47.6)	55 (52.4)		57 (54.3)	48 (45.7)	
Place of Injury						
Home	92 (47.2)	103 (52.8)	0.919	107 (54.9)	88 (45.1)	<0.001*
Work/Office	33 (47.8)	36 (52.2)		21 (30.4)	48 (69.6)	
Others	36 (50.0)	36 (50.0)		12 (16.7)	60 (83.3)	
Time of Injury						
Morning	69 (42.1)	95 (57.9)	<0.001*	68 (41.5)	96 (58.5)	0.526
Afternoon	51 (43.2)	67 (56.8)		46 (39.0)	72 (61.0)	
Evening	41 (75.9)	13 (24.1)		26 (48.1)	28 (51.9)	
Object of Injury						
Stick/thorn	75 (64.1)	42 (35.9)	<0.001*	46 (39.3)	71 (60.7)	<0.001*
Metal/Iron	30 (28.6)	75 (71.4)		37 (35.2)	68 (64.8)	
Animal horn/Hoof	16 (42.1)	22 (57.9)		28 (73.7)	10 (26.3)	
Miscellaneous	40 (52.6)	36 (47.4)		29 (38.2)	47 (61.8)	
Duration from Injury to Consultant, days						
≤2	107 (50.5)	105 (49.5)	0.220	88 (41.5)	124 (58.5)	0.939
>2	54 (43.5)	70 (56.5)		52 (41.9)	72 (58.1)	
Center of Cornea/Visual Axis Involvement						
Yes	71 (34.3)	136 (65.7)	<0.001*	36 (17.4)	171 (82.6)	<0.001*
No	90 (69.8)	39 (30.2)		104 (80.6)	25 (19.4)	
Diagnosis						
Corneal Laceration	111 (50.9)	107 (49.1)	0.135	74 (33.9)	144 (66.1)	<0.001*
Corneo-Scleral Laceration/ Scleral Laceration	50 (42.4)	68 (57.6)		66 (55.9)	52 (44.1)	

All data presented as number (%)
Chi-Square test applied, *p-value ≤ 0.05

Table 2: Frequency of associated complications (n=111)

Complications	n (%)
Hyphema	12 (10.08)
Endophthalmitis	37 (33.3)
Iris/Vitreous Prolapse or loss	31 (27.9)
Phthisis	19 (17.1)
Laceration	9 (8.1)
Bacterial Keratitis	3 (2.7)

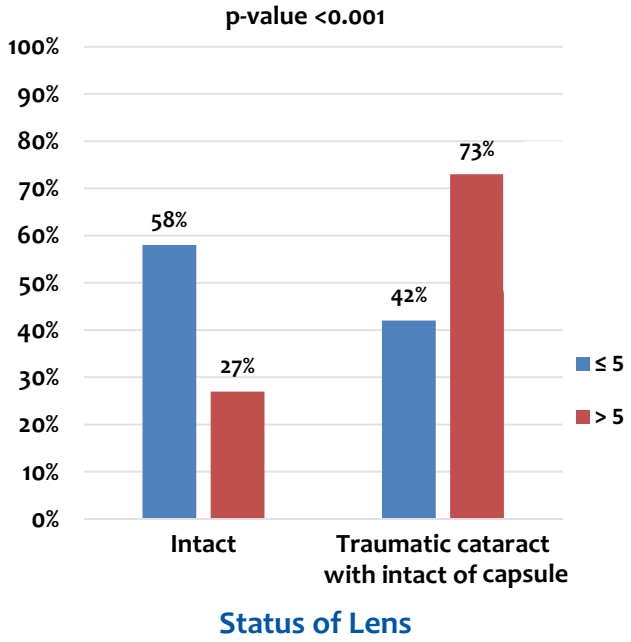

Figure 1: Association between length of wound and status of lens among patients of Open Globe Injury

DISCUSSION

The findings of the current study have reported that corneal laceration was diagnosed in sixty-five percent of patients, crone-o-scleral laceration in twenty-nine percent, and scleral laceration in six percent of patients. The average duration from injury to consultant was two days, whereas the mean length of the wound was six mm. Center of cornea/visual axis involvement was observed in sixty-two percent patients. An intact lens was observed in forty-two percent of patients, and a traumatic cataract with an intact/ruptured capsule was observed in fifty-eight percent of patients. Earlier research has consistently demonstrated that rupture serves as a mechanism of injury associated with an unfavorable visual prognosis.[10-11]

According to the current study findings, endophthalmitis was the most common complication observed in thirty-three percent of patients, iris/vitreous prolapse or loss in twenty-eight percent, and phthisis in seventeen percent of patients.

In the current study, the increased length of wound was significantly higher in patients who had injury in the morning with metal/iron as object of injury, with center of cornea/visual axis involvement, a traumatic cataract with rupture of capsule, and corneo-scleral laceration. Several other studies have also revealed an increased length of wound as an indicator of poor outcomes.[12-16]

Similar to the current study findings, males' predominance was reported in previous studies as well.[3,5,16-18] In the present study, the male–female ratio of patients with open- globe eye injury was 11:5. Male patients were predominant, as in previous reports, but the proportion of female patients was not negligible . Gender differences persisted, with females more likely to have injuries from a fall or at home as previously reported.[19,20]

In recent years, our understanding of the pathophysiology and treatment of ocular trauma has significantly advanced, alongside the progress in instrumentation and surgical techniques for the eye. As a result, the effectiveness of vitreoretinal surgery in treating injured eyes has greatly improved.[21-24] The attainment or preservation of functional vision relies on several prognostic factors, including the initial trauma's severity, the extent of involvement of ocular structures, the preoperative visual acuity, as well as the promptness of diagnosis and treatment.[21-24]

The current study findings should be evaluated with an understanding of its limitations to gain a comprehensive perspective on the results. One notable limitation is that this study was conducted at a single center, the data and observations were collected from a specific location, potentially limiting the generalizability of the findings to other settings. Since different centers might have unique patient populations, medical practices, and environmental factors, the results may not be representative of a broader population. Another important limitation is that certain crucial predictor variables were not included in the study. Despite these limitations, it is essential to acknowledge the significance of this study. It represents a commendable effort in reporting findings from one of the largest cities in the Sindh province of Pakistan. Given the limited availability of research from this region, the study fills a crucial gap in knowledge and contributes to the existing literature. To enhance the impact and validity of future studies, researchers may consider conducting multi-center studies with larger sample sizes. This approach would increase the diversity and representativeness of

the participants, improving the generalizability of the findings.

Pakistan has its own unique demographic, socioeconomic, and cultural factors that may influence the occurrence and management of globe injuries. Research specific to the Pakistani population can provide insights into these factors and guide tailored interventions.

Furthermore, the current study has not only reported the pattern of injury but also its diagnosis and associated complications. Identifying prognostic factors and visual outcomes of globe injuries in Pakistan can inform clinical decision-making, improve patient counseling, and guide treatment strategies. This can ultimately contribute to better patient outcomes and quality of care. In short, research findings on globe injuries can serve as evidence for advocating policy changes and implementing preventive measures at the national level. This can include promoting safety regulations, raising awareness, and improving access to specialized care. We believe that by practically translating the findings of the current study in Pakistan, we can enhance our understanding of this public health issue, address the specific needs of the population, and work towards reducing the burden of visual impairment caused by such injuries.

CONCLUSION

A majority of patients with globe injuries were younger, with stick/thorn and metal/iron as the most common objects of injury. Center of cornea/visual axis involvement and rupture of the capsule were observed in the majority of the patients. Object of injury and center of cornea/visual axis involvement were two prognostic factors that were significantly associated with visual outcomes of globe injuries.

ETHICAL APPROVAL: This study was approved by the Institutional Ethical Review Board Sindh Institute of Ophthalmology and Visual Sciences, Hyderabad with the No (SIVOS/EXEC, DIR/5043, dated 31/12/2021).

AUTHORS' CONTRIBUTION: AT & AAM: Study conception and design, data analysis. FSW & MAT Data analysis and interpretation of results. WAS & SAS: Draft manuscript preparation. All authors reviewed the results and approved the final version of manuscript.

CONFLICT OF INTEREST: The authors declared no conflict of interest.

FUNDING: None

Received: July 28, 2023
Accepted: October 20, 2023

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