

Original article

Visual Outcome following Blunt Ocular Trauma among Patients attended Tobruk Medical Center

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ABSTRACT

Ocular trauma is a significant public health issue that leads to blindness and disability, especially in underdeveloped nations. It represents 5% of hospitalizations and one-third of cases with notable vision impairment. The objective of this study was to assess the visual effects of blunt trauma in order to provide valuable information for the development of future care regimens. The study was a longitudinal investigation carried out at Tobruk Medical Center. It encompassed all patients admitted to the ophthalmology department with different forms of ocular trauma from January to December 2023. The study demonstrated a significant association between trauma type and visual outcome severity [$P < 0.001$], with blunt penetrating trauma having the greatest percentage of blind outcomes [63.6%]. The majority of eye injuries resulted in normal or mild vision impairment [74.1%], with only a tiny fraction leading to blindness [7%]. Visual outcomes are influenced by factors such as the nature of the trauma, the initial visual result, and the type of surgery performed. Effective supervision is essential for achieving the best possible visual results. Additional research is required to enhance the effectiveness of treatment strategies.

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INTRODUCTION

The eyeball, a weak and delicate visual organ, is susceptible to severe damage caused by trauma, leading to permanent blindness and/or impairment [1]. A profound injury that impacts the innermost layers of the cornea and other parts of the eye can lead to permanent disabilities, such as blindness, diminished vision, and other intricate ocular conditions that cannot be corrected with medication or glasses [2].

On the other hand, a head injury can lead to traumatic optic neuropathy, a condition that can cause blindness if not treated with steroids or surgery [3]. Importantly, the degree of vision impairment resulting from trauma is usually defined by the intensity of the projectile's impact [3]. Ocular trauma is a significant public health concern and a primary cause of vision loss globally, despite the fact that many cases may usually be prevented [4,5]. Unilateral vision loss, particularly in developing nations, is primarily caused by trauma [6]. The injuries have a significant influence on the global prevalence of blindness, leading to substantial financial repercussions for both individuals and society [7].

According to Thylefors [8], ocular trauma accounts for 5% of all hospitalizations in developing nations within ophthalmology. In less developed countries, it accounts for nearly one-third of cases involving substantial visual impairment.

Studies have shown that annually, more than 55 million people globally have ocular harm due to aging. This comprises around 200,000 occurrences of open-globe injuries and 750,000 incidents that necessitate hospitalization. Curiously, a significant number of these cases have been demonstrated to be more widespread in poor countries [9].

According to Sideenah [10], blunt trauma and foreign body trauma were the predominant types of injuries in Libya. An investigation examined the specific patterns of ocular trauma in Benghazi, Libya, with a particular emphasis on injuries of the eyes. Among the 805 patients, 67% experienced closed-globe injuries, 31.5% had open-globe injuries, and 1.3% had mixed trauma [11]. The present study was aimed to contribute to the existing literature on the effects of blunt ocular trauma in Libya by examining the visual outcomes of treated cases.

METHODS

Study design and setting

The study was a hospital-based longitudinal design involved patients who were attending department of Ophthalmology at Tobruk Medical Center from Jan to Dec 2023.

Data collection

Gathering patient information, which includes demographic details such as age, gender, nationality, time elapsed from injury, and the site of the event. Additionally, we recorded the presenting visual acuity (monocular), visual acuity during follow-up, cause of trauma, type of ocular trauma, and the number of eyes affected.

Statistical analysis

The study examined the independent factors of sex, age, duration of injury prior to hospital presentation, and form of injury. The outcome variable was visual impairment at the time of follow up. The study utilized multivariate logistic regression to analyze the association between the independent variables and the dependent variable. A p-value below 0.05 was deemed to be statistically significant.

RESULTS

Table 1 illustrated the distribution of nationality, duration of injury prior to presentation, and afflicted eyes among the subjects. Out of the participants, Libyan individuals made up the majority with 183(91.5%) of the total subjects.

The majority of injuries were reported within 24 hours, and there was a nearly similar distribution of injured eyes between the left and right sides. The average length of time between the occurrence of the injury and seeking medical attention was 1.76 ± 3.3 . The incidence of ocular injuries was higher in males compared to females, with a ratio of 3.2:1 (figure 1).

Table 1. Affected eye distribution of ocular trauma cases according to gender.

Age groups [N = 200]	Male N [%]	Female N [%]	Total N [%]
<=15 years	43 [28.3%]	21 [43.8%]	64 [32%]
16-25	39 [25.7%]	10 [20.8%]	49 [24.5%]
26-35	45 [29.6%]	7 [14.6%]	52 [26%]
>=36	25 [16.4%]	10 [20.8%]	35 [17.5%]
Nationality			
Libyan	136 [89.5%]	47 [97.9%]	183 [91.5%]
Not Libyan	16 [10.5%]	1 [2.1%]	17 [8.5%]
Duration of injury before presentation [days] * 1.76[3.3]			
Within 1 day	68 [44.7%]	25 [52.1%]	93 [46.5%]
After one day	84 [55.3%]	23 [47.9%]	107 [53.5%]
Affected eyes [N = 216]			
Both	12 [7.9%]	2 [4.2%]	14 [7%]
Left	70 [46.1%]	20 [41.7%]	90 [45%]
Right	70 [46.1%]	26 [54.2%]	96 [48%]

*Mean [standard deviation]

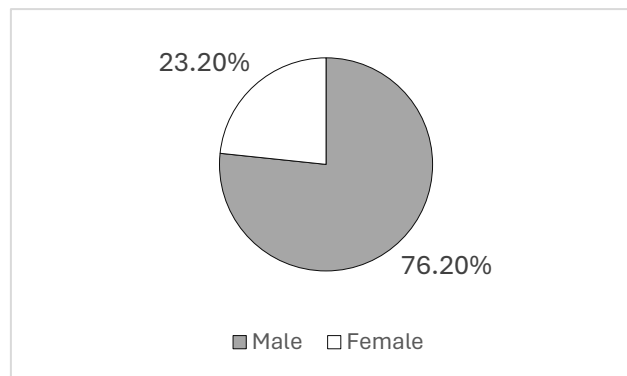


Figure 1. Male: female ratio of the ocular trauma cases

According to the data, most ocular injuries in both adults and children are caused by blunt objects, accounting for 165 instances or 84.2% of the total. Gunshots injuries include 16 instances, which represents 8% of the total, while perforating injuries account for 7 cases, making up 3.2%. Less frequent causes include explosives, chemicals, and heat sources. Regarding the causes of eye injuries, the majority of instances, accounting for 54.5%, are attributed to household duties, while work-related occurrences account for 17.5%. Occurrences of fights, vehicle accidents, and other random incidents have decreased in frequency (Table 2).

Table 2. Causes and circumstances of eye damage

Variables	Adult	Child	Total
Nature			
Blunt objects	98 [79%]	67 [88.2%]	165 [84.2%]
blunt penetrating [gunshots]	14 [11.3%]	2 [2.6%]	16 [8%]
Perforating	5 [4%]	2 [2.6%]	7 [3.5%]
Explosive	4 [3.2%]	3 [3.9%]	7 [3.5%]
Chemical	0	2 [2.66%]	2 [1%]
Thermal	3 [2.4%]	0	3 [1.5%]
Event			
Fight	25 [20.2%]	4 [5.3%]	29 [14.5%]
Car Accident	17 [13.7%]	4 [5.3%]	21 [10.5%]
Home Duties	49 [39.5%]	60 [78.9%]	109 [54.5%]
Work	32 [25.8%]	3 [3.9%]	35 [17.5%]
Other	1 [0.8%]	5 [6.6%]	6 [3.1%]

Table 3 data indicates that a greater proportion of adults necessitate hospitalization in comparison to children, with 74 adults (59.7%) being admitted as opposed to 25 children (32.9%). Regarding management, a greater proportion of adults need surgery for their eye injuries, with 66 cases (53.2%) requiring an operation, compared to only 17 cases (22.4%) for children. Moreover, there were occasions when we encountered difficulties in sustaining communication with specific persons during the follow-up procedure. Moreover, the evaluation of visual outcomes in young children posed difficulties, leading to a restricted sample size of only 185 instances for establishing the future outcomes of their vision. Out of the eye injuries, a significant proportion of 140 cases (75.7%), resulted in normal or mild visual impairment, whereas 11 cases (5.9%) led to blindness (Table 4).

Gender does not have a significant impact on the severity of eye injuries ($P > 0.05$). However, older age groups are more prone to have severe visual outcomes compared to younger age groups, although this difference is not statistically significant ($p > 0.05$). The duration of the damage does not have a significant impact on the visual outcome during the follow-up period, with a p-value greater than 0.05. The study revealed a strong association between the kind of trauma and the severity of visual outcomes. Blunt penetrating trauma, specifically gunshot wounds, had the largest proportion of cases resulting in blindness, with a significant statistical significance ($p < 0.001$). There is a strong association between the visual outcomes observed during the initial presentation and those observed during the follow-up, with a p-value of less than 0.001. Individuals who experienced severe results were more prone to have surgical intervention compared to

those with mild or moderate outcomes. Furthermore, the presence or absence of surgery had a notable effect on visual outcome, as indicated by a significant influence ($P < 0.001$).

Table 3. Injury classification and management.

Hospital admission	Adult	Child	Total
Cases that were admitted to the hospital	74 [59.7%]	25 [32.9%]	99 [49.5%]
Cases that were not hospitalized	50 [40.3%]	51 [67.1%]	101 [50.1%]
Management			
Operated	66 [53.2%]	17 [22.4%]	83 [41.5%]
Not operated	58 [46.8%]	59 [77.6%]	117 [58.5%]

Table 4. Visual consequences resulting from ocular trauma

Visual acuity in the injured eye*	N= 185	
	At baseline [n,%]	At follow-up [n,%]
6/6-6/18 [normal or mild visual impairment]	137 [74.1%]	140 [75.7%]
<6/18-6/60 [moderate VA impairment]	20 [10.8%]	18 [9.7%]
<6/60-3/60 [severe VA impairment]	15 [8.1%]	16 [8.6%]
<3/60-NPL [Blindness]	13 [7%]	11 [5.9%]

*Categorized according to the World Health Organization classification of visual acuity.

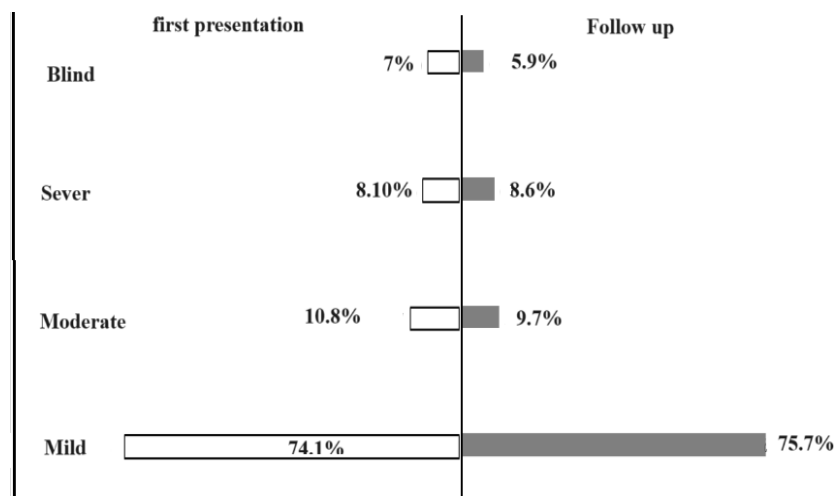


Figure 2. Comparison between baseline and ultimate visual acuity expressed as a percentage.

Table 5. Correlation between visual outcome at follow-up and various factors such as sex, age, PPE use, place, and time until trauma care and patient residence.

Factor	Mild	Moderate	Sever	Blind	P value
Gender					
Male	103 [73.6%]	14 [77.8%]	14 [87.5%]	10 [90.9%]	0.789
Female	36 [25.7%]	4 [22.2%]	2 [12.5%]	1 [9.1%]	
Age categories					
<=15 years	44 [31.7%]	4 [22.2%]	2 [14.3%]	0	0.095
16-25	31 [22.3%]	5 [27.8%]	8 [57.1%]	4 [40%]	
26-35	36 [25.9%]	5 [27.8%]	4 [28.6%]	4 [40%]	
>=36	28 [20.1%]	4 [22.2%]	0	2 [20%]	
Duration of injury before presentation [days]					
Within one day	113 [80.7%]	16 [88.9%]	14 [87.5%]	11 [100%]	0.732

After one day	26 [18.6%]	2 [1.1%]	2 [12.5%]	0	
Type of trauma					
Blunt	131 [94.2%]	12 [66.7%]	6 [37.5%]	2 [18.2%]	<0.001*
Blunt penetrating	1 [0.7%]	3 [16.7%]	5 [31.3%]	7 [63.6%]	
Perforating	0	1 [5.6%]	4 [25%]	0	
Explosive	1 [0.7%]	1 [5.6%]	1 [6.3%]	2 [18.2%]	
Chemical	3 [2.2%]	1 [5.6%]	0	0	
Thermal	3 [2.2%]	0	0	0	
Visual outcome at first presentation					
Mild	137 [97.9%]	0	0	0	
Moderate	3 [2.1%]	17 [94.4%]	0	0	<0.001*
Sever	0	1 [5.6%]	14 [87.5%]	0	
Blind NPL	0	0	2 [12.5%]	11 [100%]	
Management					
Operated	52 [37.1%]	4 [22.2%]	12 [75%]	11 [100%]	<0.001*
Not operated	86 [61.4%]	14 [77.8%]	4 [25%]	0	

*Statistical significance

DISCUSSION

Eye injuries are a preventable cause of visual impairment [12]. Our study presents a comprehensive review of ocular injuries in a tertiary hospital located in Tobruk.

Our research findings indicate that a substantial majority of injuries, particularly 72.8%, occurred in youth aged 15 years or younger. Shoja et al. found that the age range of 7-12 years had the highest proportion (58.3%) of injuries (13). The higher incidence of ocular injuries in this specific age group corresponds to the findings of a study conducted by Sofi et al. [14] in Srinagar. Contrary to our results, El-Sebaity et al. [15] found that most occurrences of pediatric trauma in Egypt occurred in children aged 2 to 7 years. Previous research [16,17] has also documented comparable results.

Males had a much higher occurrence of ocular injuries, with a ratio of 3.8:1. The observed pattern aligns with previous epidemiological research, which has documented male-to-female ratios ranging from 1.8:1 to 5.4:1 [14–24]. The observed variation can be related to the higher inclination for aggressive and violent conduct displayed by boys compared to girls [18,22,25]. Niiranen et al. revealed that incidents involving girls were uniformly distributed among all age groups [26].

Our research revealed a significantly elevated likelihood of ocular harm in females below the age of 15. The risk is nearly equivalent across various age groups in boys. This observation is in agreement with the results obtained from investigations carried out by Hosseini et al. from Iran [27], Ilhan et al. from Turkey [28], and Lee et al. from Taiwan [16]. The gender gap grows dramatically in older age groups [26,27]. The lower representation of men in younger age groups can be related to the fact that boys and girls engage in similar routine activities during their early years [28].

Several studies have shown that the majority of injuries occur at home, emphasizing the importance of taking proactive measures to prevent such accidents in the domestic environment. Similarly, our research findings indicate that the majority of eye injuries occurred at home, accounting for 40.3% and 83.6% of cases among adults and children, respectively. El-Sebaity et al. [15] found that the road is a major site for injuries in Egypt, representing 54.7% of cases. This discovery aligns with the investigation carried out by Sofi et al. [18] and Shoja et al. [18]. However, our results do not align with theirs, as only 10.7% of the ocular injuries occurred as a result of road traffic accidents (RTA). Our analysis revealed that fights were the second leading cause of adult injuries, similar to findings in Ethiopia and South Africa [30,31].

However, among the adult patients in our sample, work-related injuries ranked as the third most frequent. Following fundamental safety measures, such as donning polycarbonate safety glasses, can effectively reduce occupational incidents in agricultural and industrial settings.

Blunt penetrating and non-penetrating were the predominant types of eye injury in our investigation, followed by Perforating, Explosive, Chemical, and Thermal. These findings align with majority of injuries in the age of older than 15 years were caused by blunt objects and explosions. [18] research carried out in African nations indicated that 25% of eye injuries in children were caused by gunfire, 24.2% by tools, and 21.8% by assault. These findings highlight the cultural and socio-economic disparities within countries [29, 27]

The study by Serrano et al. [20] presents those scissors and knife are frequently encountered sharp devices in typical households. Sharp wooden objects, toys, and animal teeth/nails were the most commonly found items to cause eye trauma in the preschool age group. These findings are consistent with other studies conducted in Turkey [28] and Malaysia [32].

The incidence of accidents caused by the use of sharp objects as toys remains a chronic problem in underdeveloped countries. The incorrect utilization of playthings is a common cause of injury among young children, frequently resulting from their improper or careless handling. When designing safety requirements for toy manufacture, it is crucial to assess and include this information [21]. According to the research, surgical intervention was required for 35%, 47.56%, and 48% of patients who experienced ocular trauma. Surgical intervention was performed in 40.3% of all patients in our study [23–21]. The present study revealed that a significant proportion of individuals suffering from ocular injuries did not require surgical intervention, aligning with previous research conducted in different settings [33–35]. However, over 33% of the patients necessitated a surgical intervention on their eyes. Enucleation and evisceration were considered as definitive surgical interventions for eyes that could not be maintained. Eye removal surgery in Malawi is commonly performed due to ocular injury [36].

Damage to the eye is a significant cause of visual loss in one eye and total blindness [8,37]. The current study demonstrates a prevalence of monocular blindness of 5.9% following therapeutic follow-up, significantly lower than the published prevalence of monocular blindness ranging from 34.3% to 76.6% in studies conducted in Ghana and Ethiopia [38–40]. Although persons with monocular blindness may not satisfy the legal criteria for blindness, these impairments significantly affect their depth perception, field of vision, overall visual perception, and prospective job prospects [41,42]. There is multiple limitation of this study. The study was carried out at a specialized tertiary hospital that gets patient referrals. Patients with minor eye injuries, especially those in distant areas, may have been treated at their local healthcare facilities instead of being sent to the tertiary hospital.

CONCLUSION

Eye injuries remain a major cause of eye-related health problems in children and in informal work environments. It is imperative to educate parents about the significance of preventing eye injuries in children at home and during recreational activities, while also providing schools with knowledge on accident prevention techniques. The final visual outcome for patients with ocular injuries is significantly influenced by the type of damage, initial visual outcome, and the performance of surgery. These findings emphasize the significance of timely and suitable treatment of eye injuries in order to attain the most favorable visual result. Early surgical intervention may be advantageous for those with severe results, since it can enhance their likelihood of regaining visual function. Additional study is required to have a deeper understanding of the factors that impact visual outcomes in cases of eye injuries and to enhance treatment techniques for these patients.

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النتائج البصرية بعد الإصابات العينية الحادة بين المرضى الذين يراجعون مركز طب بصرية في عام 2023

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المخلص

تعتبر الصدمات العينية مشكلة صحية عامة مهمة تؤدي إلى العمى والإعاقة، خاصة في الدول المتخلفة. وهو يمثل 5% من حالات الاستشفاء وتثلث الحالات التي تعاني من ضعف ملحوظ في الرؤية، وكان الهدف من هذه الدراسة هو تقييم التأثيرات البصرية للصدمة الحادة من أجل توفير معلومات قيمة لتطوير نظم الرعاية المستقبلية. كانت الدراسة عبارة عن تحقيق طولي تم إجراؤه في مركز طب بصرية. وقد شملت جميع المرضى الذين تم إدخالهم إلى قسم طب العيون والذين يعانون من أشكال مختلفة من الصدمات العينية في الفترة من يناير إلى ديسمبر 2023. وأظهرت الدراسة وجود ارتباط كبير بين نوع الصدمة وشدة النتائج البصرية [P < 0.001]، مع وجود إصابة حادة مختلقة بأكثر نسبة من حالات المكفوفين (63.6%). أدت غالبية إصابات العين إلى ضعف عادي أو معتدل في الرؤية (74.1%)، مع جزء صغير فقط يؤدي إلى العمى (7%). تتأثر النتائج البصرية بعوامل مثل طبيعة الصدمة والنتيجة البصرية الأولية ونوع الجراحة التي يتم إجراؤها. يعد الإشراف الفعال أمرًا ضروريًا لتحقيق أفضل النتائج البصرية الممكنة. هناك حاجة إلى مزيد من البحث لتعزيز فعالية استراتيجيات العلاج.

الكلمات الدالة: طب بصرية، إصابة العين، ليبيا.