

PEDIATRIC OCULAR TRAUMA: -EXPERIENCE OF A TERTIARY CENTER IN MOROCCO-

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ABSTRACT

Purpose: To study the epidemiology, the mechanism, the cause and outcomes of pediatric ocular trauma.

Material and methods: This retrospective study included 102 children who presented to the eye emergency unit during one year. Demographic data, mechanism, cause and management were recorded. Trauma types were defined using the BETT classification (Birmingham Eye Trauma Terminology). This data was analyzed using SPSS® software.

Results: Trauma was more common in males (87.3%). Mean age (years) was 9.9±4. Median time of consultation was 12 hours. Ocular trauma occurred in the street (60.8%), mostly during fights (34.3%). The most common cause of injury was stone (23.8%). Closed globe trauma (56.9%) were more common. Initial visual acuity (VA) was 1.2 ± 1 for closed globe trauma versus 2 ± 0.6 for open globe trauma ($p \leq 0.01$). Contusions (87.9%) were more common in closed globe injuries while penetrating lacerations (84.1%) were more frequent in open globe injuries. Severe visual loss was found in 48.8% of open globe injuries versus 13.2% of closed globe injuries ($p \leq 0.01$). Intravitreal hemorrhage, traumatic maculopathy, retinal detachment, choroidal detachment, papilledema, orbital fractures, and zone 3 injuries were the factors associated with severe visual loss.

Conclusion: Prevention remains a cornerstone in the management of pediatric ocular trauma by rising public awareness.

Keywords: Closed globe injury; Ocular Trauma; Open globe injury; Pediatric Trauma.

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INTRODUCTION

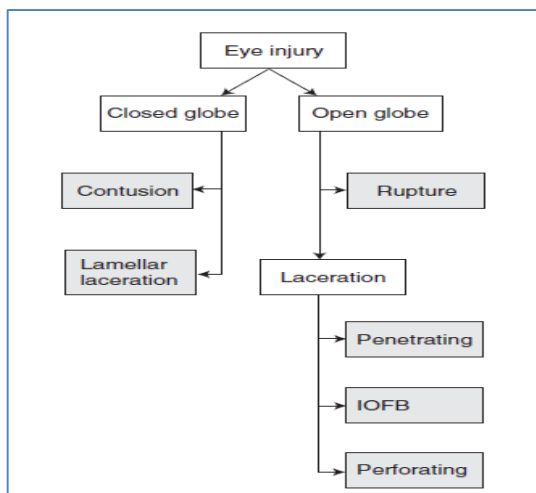
Ocular trauma is a common cause of acquired blindness throughout the world. It's estimated that 1.6 million people are blind from eye injuries [1], 2.3 million people with bilateral low vision from trauma and 19 million have unilateral visual loss [2, 3]. Eye injuries occur frequently in the pediatric population and measure about 8-14% of the total childhood injuries. They represent the most common cause of non-congenital blindness in children [4], even with adequate management [5]. Pediatric ocular trauma can be challenging, due sometimes to children lack of communication causing a delay of consultation and difficult examination especially for infants, requiring general anesthesia. In developing countries, the lack of proper supervision increase the likelihood of eye injuries among children [2, 5].

Pediatric ocular trauma can lead to poor prognosis due to the severity of injuries in addition to the risk of amblyopia despite proper anatomical restoration [6, 7]. A large number of studies on ocular trauma have been conducted in developed countries [8-10] but the pattern of eye injuries in developing countries is not well known. The purpose was to study the epidemiology, the mechanism, the cause and the outcome of pediatric ocular trauma in a moroccan tertiary hospital in order to estimate the burden of childhood preventable blindness.

PATIENTS AND METHODS

This retrospective study was conducted in the tertiary hospital of Rabat (Morocco): “Hôpital des Spécialités”. All patients with ocular trauma aged between 0-16 years presenting to the eye emergency unit from January 2017 to December 2018 were included and evaluated for epidemiological

parameters like age, sex distribution, delay before presentation to the hospital, cause and type of injury. The study was conducted according to the Declaration of Helsinki. All patients underwent complete examination including visual acuity (VA) at presentation measured when possible using Monoyer scale or Pigassou scale in younger children, anterior segment and fundus examination, imaging studies obtained, in addition to medical and surgical management. Examination under general anesthesia was required when slit-lamp examination was impossible. Trauma types were defined using the BETT classification (Birmingham Eye Trauma Terminology) (figure 1) [11].



IOFB: intraocular foreign body.
The shaded boxes represent the actual diagnoses that are used clinically.

Figure 1: BETT classification of ocular injuries [11].

Open globe injuries are defined by their location of the most posterior extent of the laceration as following: Zone 1 injuries are limited to the cornea. Zone 2 injuries extend from the limbus to 5 mm posterior to the limbus. Zone 3 injuries include all eye wall injuries posterior to zone 2 injury [12]. Follow-up findings were noted at 2 weeks, 1 month, 2 month and 3 months; and final best corrected visual acuity was taken at the end of 3 months. Severe visual loss was defined as final VA $\leq 1/10$. Statistical analysis was performed using SPSS software version 20 (IBM, Chicago, IL). Continuous data are presented as mean \pm standard error of the mean and was compared using t-student test and Mann-Whitney test. Whereas categorical data are presented as proportions. A “p value” of ≤ 0.05 was considered significant.

RESULTS

One hundred and two children were included in this study. Trauma was more common in males (87.3%). Mean age (years) was 9.9 ± 4 . Median time for consultation was 12 hours but 20.6% of patients presented to the eye emergency 24 hours after the trauma. Ocular trauma occurred in the street (60.8%), mostly during assault or violent altercations (34.3%), during summer (30.4%) or spring (29.4%). However we found that circumstances were different depending of age groups (figure 2). **Table I** summarizes epidemiological features of this study. We found 29 different causes of eye injury (**Table II**), the most common ones were stone (23.8%), wooden stick (14.9%) and knife (13.9%).

Table I: Characteristics of pediatric ocular trauma in this study.

Characteristics	Values
Patients ^a	102 (100)
Sex ^a	
▪ Boys	89 (87.3)
▪ Girls	13 (12.7)
Age (years) ^b	9.9 ± 4
▪ 0-1 year	1 (1)
▪ 2-6 years	25 (24.5)
▪ 7-12 years	46 (45.1)
▪ 13-16 years	30 (29.4)
Time of consultation (hours) ^c	12 [6-24]
▪ Consultation ≤ 24 hours ^a	81 (79.4)
▪ Consultation > 24 hours ^a	21 (20.6)
Eye involved ^a	
▪ Right eye	45 (44.1)
▪ Left eye	57 (55.9)
▪ Both eyes	0
Circumstances of eye injury ^a	
▪ Assault / violent altercations	34 (34.3)
▪ Home	33 (33.3)
▪ Leisure time	25 (25.3)
▪ School	6 (6.1)
▪ Traffic accidents	1 (1)
Seasons ^a	
▪ Summer	31 (30.4)
▪ Autumn	25 (24.5)
▪ Winter	16 (15.7)
▪ Spring	30 (29.4)
Initial VA (Log MAR) ^c	1.4 [0.5-2.2]
▪ VA $\leq 1/10$ ^a	11 (68.8)
▪ VA $> 1/10$ ^a	5 (31.3)

VA: Visual acuity
a: Frequency (percentage)
b: Mean \pm standard error of the mean
c: Median [interquartile range]

Table II: Cause of eye injuries in children.

Cause of ocular trauma	Frequency (%)
Stone	24 (23.8)
Wooden stick	15 (14.9)
Knife	14 (13.9)
Pen	4 (4)
Glass shards	4 (4)
Thorn	4 (4)
Metallic wire	4 (4)
Punch	3 (3)
Keys	3 (3)
Iron bar	3 (3)
Electric wire	2 (2)
Bottle	2 (2)
Belt	2 (2)
Pipe	2 (2)
Jumping rope	1 (1)
Whip	1 (1)
Ball	1 (1)
Fireworks	1 (1)
Egg	1 (1)
Shoe	1 (1)
Fishing rod	1 (1)
Watermelon	1 (1)
Finger	1 (1)
Window	1 (1)
Fall from bike	1 (1)
Compass	1 (1)
Bottle cap	1 (1)
Screwdriver	1 (1)
Piece of plastic	1 (1)

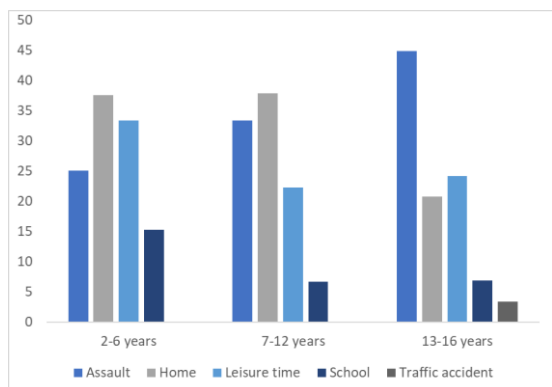


Figure 2: Circumstances of pediatric ocular trauma according to age.

Closed globe trauma (56.9%) (**Figure 3**) occurred more frequently than open globe injury (43.1%) (**Figure 4**).

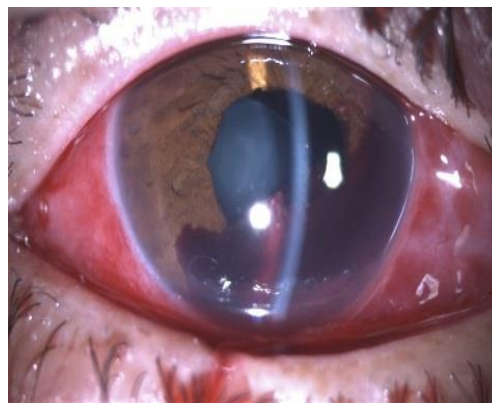


Figure 3: Closed globe trauma causing hyphema and lens subluxation.



Figure 4: Pediatric ocular trauma resulting in corneo-scleral laceration.

Initial visual acuity (VA) was 1.2 ± 1 for closed globe trauma versus 2 ± 0.6 for open globe trauma ($p \leq 0.01$). Contusions (87.9%) were more common in closed globe injuries, followed by lamellar lacerations (8.6%) and superficial foreign body (3.4%). Hyphema was the most common complication of closed globe injuries and occurred in 86.2% of cases. Penetrating lacerations (84.1%) were frequently found in open globe injuries, followed by globe rupture (15.1%) and intraocular foreign body (4.5%). Most of the eyes presented with zone 1 injury (62.5%) compared with 25% with zone 2 injury and zone 3 (12.5%) (Table III).

Table III: Type of ocular trauma and their consequences.

Type of ocular trauma	Values (%)
Closed globe injuries	58 (56,9)
▪ Contusion	51 (87,9)
▪ Lamellar laceration	5 (8,6)
▪ Superficial foreign body	2 (3,4)
▪ Clinical consequences	
Hyphema	50 (86,2)
Corneal abrasions	19 (32,8)
Corneal edema	16 (27,6)
Mydriasis	15 (25,6)
Iris sphincter tears	9 (15,5)
Berlin's edema	8 (14,3)
Cataract	7 (12,1)
Vitreous hemorrhage	7 (12,1)
Intraretinal hemorrhage	5 (8,9)
Optic nerve neuropathy	4 (7,1)
Bruch's membrane rupture	3 (5,4)
Orbital fracture	2 (3,6)
Retinal dialysis	1 (1,8)
Retinal detachment	1 (1,8)
Lamellar macular hole	1 (1,8)
Open globe injuries	44 (43,1)
▪ Laceration	37 (84,1)
▪ Rupture	7 (15,9)
▪ IOFB	2 (4,5)
▪ Clinical consequences	
Zone 1	25 (62,5)
Zone 2	10 (25)
Zone 3	5 (12,5)
Cataract	27 (62,8)
Hyphema	17 (38,6)
Vitreous hemorrhage	15 (34,1)
Iris sphincter tears	9 (22)
Eyelid lacerations	7 (15,9)
Retinal detachment	6 (14)
Iridodialysis	4 (9,5)
Choroidal detachment	3 (8,6)
Intra-retinal hemorrhage	1 (3,7)
VA at admission (LogMAR)	
Closed globe injuries	1.2 ± 1
Open globe injuries	2 ± 0.6

Visual axis was involved in 27.3% of cases. In our study, 62.8% of open globe injuries were sutured in less than 24 hours. Severe visual loss was found in 48.8% of open globe injuries versus 13.2% of closed globe injuries ($p \leq 0.01$). Intravitreal hemorrhage, traumatic maculopathy, retinal detachment, choroidal detachment, papilledema, orbital fractures, and zone 3 wounds were the factors associated with severe visual loss ($p \leq 0.05$). Two patients had extraocular involvement which included facial bone fractures in one case and maxillary sinus hematoma in the other.

DISCUSSION

Pediatric ocular trauma is responsible of visual impairment and can lead to unilateral blindness, with a significant psychological impact. In our study, Mean age was 9.9 years old. We found a higher incidence of eye injuries in the group “7-12 years old” (45.1%), while Al-Mahdi et al. (2) found a higher incidence in the group above 5 years old (58.5%). In their study, Qayum et al. [1] reported 41.1% of eye injuries in the group “2-6 years old”, followed by the group “7-12 years old” (33.89%). Similar results were reported in the literature [9, 13-15], as children of this age tend to be more active and gain some freedom to play without supervision [2]. Trauma was more common in males (87.3%), which is similar to the literature and can be explained by the boys’ risky behavior during playing.

In our study, assault or violent altercations were responsible of 34.3% of eye injuries, closely followed by home injuries (33.3%). However, home accidents were the most common cause of injury for children aged 2 to 12 years old whereas assaults concerned mostly children above 13 years old. At that age, we found also traffic accidents to be responsible of eye injuries. The frequency of outdoors trauma, often during summer is due to lack of adult supervision especially during school holidays. However, in a Qatari study, there was a lower rate of trauma during school vacations since a large section of population travel outside the country [2].

We found 29 different causes of eye injuries in this study, with 23.8% due to stone-throwing. This high prevalence injury is thought to be related to the low socio-economic level. In India [1], the history of fall was present in 35% of cases. While in Qatar [2], sticks were the commonest cause of injuries and finger nail trauma were reported frequently in France [6].

In the literature [6, 13-17], as in this study, closed globe trauma is more common than open globe injury. However, few authors found open globe injuries to be more frequent with a prevalence up to 73.4% [6, 18-21]. In our study, open globe trauma is related to the high incidence of blunt agents such as stones and wooden sticks.

Poor prognosis was often found in open globe trauma [2]. In our study, initial visual acuity was lower in case of open globe injury and visual axis was involved in 27.3% of cases. Final visual acuity was $\leq 1/10$ in 48.8% of open globe injuries versus 13.2% of closed globe injuries. Despite management, 29.2% of patients had severe visual loss at the last follow-up examination. This result is due to the severity of ocular trauma, delay of consultation, limited access to corneal grafts and difficult management of amblyopia. Many authors [2, 9, 13] argued that visual outcome mainly depended on the type of injury, its extent, severity and initial visual acuity, with worse prognosis in open globe injury than closed globe injury as it's usually presented with more severe ocular involvement and more impaired initial visual acuity. The goal of our study was to draw a portrait of ocular injuries in Rabat (Morocco). Our results are comparable in general to those of the literature and underline the importance of ocular morbidity in children after eye injury. Ocular trauma remains a preventable cause of unilateral blindness and increases the economic burden on public health system. Therefore, we insist on close supervision of children, and rising awareness of eye injury among parents with particular emphasis on danger points within the domestic environment especially sharp objects like knives and needles, and emphasize the importance of increasing problem of non-accidental injury. In case of ocular trauma, it is mandatory to seek medical attention at the earliest.

All of the above demonstrates the importance of collaborative work between health professionals: ophthalmologists, pediatricians and other professionals involved in the health care of children. Understanding the fundamentals of eye trauma will help decrease associated ocular morbidity and visual loss. In addition, public health campaigns aimed at parents, care-givers, teachers and children promoting awareness of eye safety would greatly reduce risky behavior [2].

Conflict of Interest:

None of the authors have any financial interest.

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