

Research Article

Pediatric Ocular Trauma Caused by Blunt Weapons: Epidemiological, Clinical and Therapeutic Aspects in the Pediatric Ophthalmology Unit at the Teaching Hospital of Bouake

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Abstract

Introduction: Ocular trauma in children represents a significant cause of ocular morbidity in Africa. Identifying the causative agent is crucial, as it provides insight into the severity of the impact and helps understand the potential injuries sustained. The aim of our study was to describe the epidemiological, clinical and therapeutic characteristics of pediatric ocular trauma caused by sharp or bladed weapons.

Methodology: This study included children aged 0 to 15 years who presented to the pediatric ophthalmology unit between January 1, 2021 and December 31, 2024, with ocular trauma. Data were collected from medical records, outpatient registers, on-call logs and operative reports. Collected variables included sociodemographic, clinical, therapeutic data and sequelae.

Results: The age group of 6 to 10 years was the most represented, accounting for 47.6% of cases. Males were predominant, with a sex ratio of 1.77. Most injuries occurred at home (47.6%). Knives were the most frequently identified causative agent, involved in 16.7% of cases. Corneoscleral laceration with iris prolapse was the most common anterior segment lesion, observed in 31% of patients. Traumatic cataract was the most frequent sequela, occurring in 14.3%.

Conclusion: Pediatric ocular trauma caused by bladed weapons can be potentially severe and often occurs within the home environment. Sequelae following recovery are common and may significantly compromise visual and functional outcomes.

Keywords: Ocular Trauma; Children; Bladed Weapons; Bouaké

Abbreviations

NLP: No Light Perception; LP: Light Perception; HM: Hand Motion; CF: Counts Fingers; Not measured: Children under 5 years old, uncooperative

Introduction

Ocular trauma in children represents a significant cause of ocular morbidity in Africa [1-3]. The initial severity of the trauma, the causative agent and the extent of injuries in a developing eye are predictive factors for functional prognosis [4,5]. Difficulties in management and long delays in seeking medical consultation further worsen outcomes in pediatric ocular trauma under our hospital practice conditions. Injuries range from mild contusions to globe rupture [6]. Trauma-related lesions may affect one or multiple structures of the eyeball, involving both anterior and posterior segments. In some cases, ocular adnexa may also be affected [7]. According to the World Health Organization, more than 1.5 million people worldwide are blind as a result of ocular

trauma [8,9]. Penetrating injuries account for 19 million cases of monocular blindness annually, with 32 to 75% occurring in children [10].

Identifying the causative agent is crucial, as it provides insight into the force of impact and helps explain the nature of potential injuries. Multiple agents are frequently implicated in pediatric ocular trauma [7]. In sub-Saharan Africa, plant materials are the most commonly reported causative agents, with a predominance among males [11]. In contrast, in developed countries such as the United States [12], metallic blunt objects (scissors, knives, blades) are most frequently reported. In Côte d'Ivoire, studies by Gbé and Soumahoro found metallic agents to be predominant [4,13].

The aim of our study was to determine the epidemiological, clinical and therapeutic characteristics of ocular trauma caused by sharp weapons in children and adolescents treated at the pediatric ophthalmology unit of the teaching hospital in Bouaké.

Methodology

This was a four-year retrospective study conducted from January 1, 2021, to December 31, 2024. The study population consisted of cases of ocular trauma managed at the pediatric ophthalmology unit of the Teaching Hospital (TH) in Bouaké during the study period. Included in the study were children aged 0 to 15 years who presented to the pediatric ophthalmology unit between January 1, 2021 and December 31, 2024, with ocular trauma. Cases of ocular trauma with incomplete or insufficient data were excluded. For data collection, all ocular trauma cases recorded during the study period were identified. Only cases involving children aged 0 to 15 years were included, using a standardized data collection form. The sources consulted included medical records, outpatient registers, on-call logs and surgical reports.

The following variables were recorded:

- Epidemiological (gender, age, school status, time to consultation, location of trauma, circumstances of injury, causative agent)
- Clinical (visual acuity at admission and at healing, ocular lesions identified on examination)
- Treatment (type of treatment administered)
- Outcome (sequelae)

Data were analyzed using SPSS software, version 16. Confidentiality and anonymity were maintained throughout the study, which was conducted in accordance with the ethical guidelines of the Declaration of Helsinki.

Results

Age (Fig. 1)

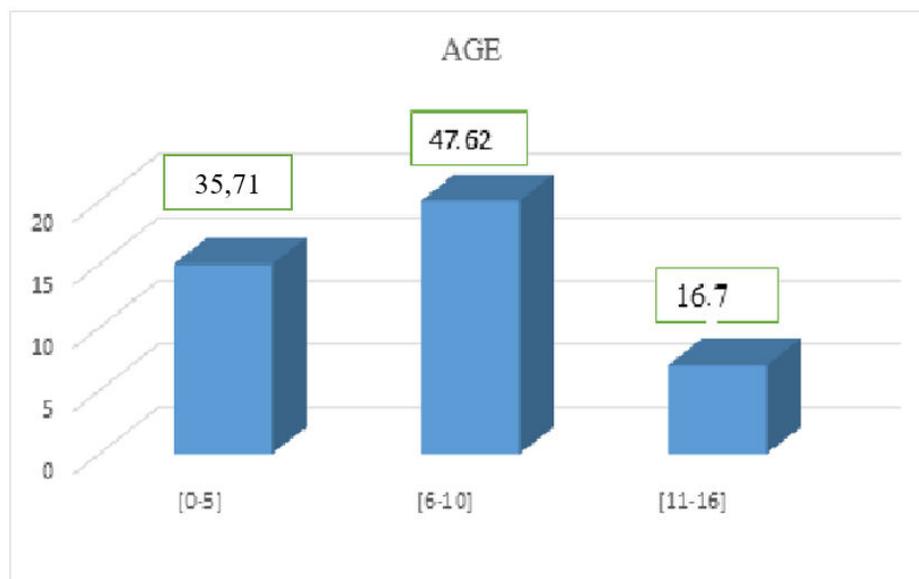


Figure 1: Distribution of patients by age.

The age group of 6 to 10 years was the most represented, accounting for 47.62% of cases (Table 1).

Male patients represented 64% of cases with a sex ratio of 1.77.

The majority of patients were school-enrolled, representing 64% of cases (Fig. 2-4).

Location	Number of Cases	Percentage
Family home	20	47.6
Rural environment	5	11.9
Apprenticeship workshop	2	4.8
School setting	1	2.4
Street	1	2.4
Unspecified	13	30.9
Total	42	100

Table 1: Location of trauma occurrence.

Ocular trauma occurring in the family home was the most frequently reported, accounting for 47.6% of cases (Table 2).

Circumstance of Occurrence	Number of Cases	Percentage
Play-related accident	18	42.8
Work-related accident	4	9.5
Physical altercation	4	9.5
Training-related accident	3	7.1
Household chores	3	7.1
Punitive corporal punishment	2	4.7
Unspecified	8	19.1
Total	42	100

Table 2: Circumstances of trauma occurrence.

Play-related accidents were the most common circumstance of trauma, accounting for 42.8% of cases (Table 3).

Type of Traumatic Agent	Number of Cases	Percentage
Knife	7	16.7
Machete	6	14.3
Sharp point	4	9.5
Pliers	4	9.5
Neddle	3	7.2
Scissors	3	7.2
Screwdriver	2	4.7
Reinforcing steel rod	2	4.7
Bracelet	1	2.4
Fishhook	1	2.4
Unspecified	9	21.4
Total	42	100

Table 3: Nature of the traumatic agent.

Knives and machetes were the most frequently involved agents in ocular trauma, accounting for 16.7% and 14.3% of cases, respectively (Table 4).

Time to Consultation	Frequency	Percentage
[0-2 DAYS]	27	62.3
[2-3 DAYS]	6	14.3
[3 -7 DAYS]	3	7.1
[7 -15 DAYS]	3	7.1
[15 -30 DAYS]	1	2.4
>30 DAYS	2	4.8
Total	42	100

Table 4: Distribution of patients according to time to consultation.

Following the occurrence of ocular trauma, the majority of patients-62.3%-sought consultation within 2 days (i.e., within 48 hours) (Table 5).

Visual Acuity	At admission		After Treatment	
	Number of Cases (n)	Percentage (%)	Number of Cases (n)	Percentage (%)
No Light Perception (NLP)	10	23.8	11	26.2
Light Perception (LP)	4	9.5	2	4.8
Hand Motion (HM)	1	2.4	3	7.1
Counts Fingers (CF)	5	11.9	2	4.8
1/10 - 3/10	3	7.1	6	14.3
3/10- 5/10	2	4.8	3	7.1
5/10 – 10/10	6	14.3	10	23.8
Not Measured	11	26.2	5	11.9
Total	42	100	42	100

Table 5: Distribution of patients according to visual acuity in the injured eye.

Following the trauma, 23.8% of patients had a visual acuity reduced to no light perception at the time of admission (Table 6).

Ocular Structure Involved	Type of Injury	Number of Cases	Percentage
Adnexa	Eyelid laceration	11	26.2
	Conjunctival hemorrhage	30	71.4
Anterior Segment	Isolated corneoscleral laceration	12	28.6
	Hyphema	6	14.3
	Corneoscleral laceration + iris prolapse	13	31.0
	Hypopyon	4	9.5
	Intraocular foreign body	2	4.6
	Lens dislocation and opacification	4	9.5
Posterior Segment	Vitreous hemorrhage	6	14.3
	Retinal detachment	1	2.4
	Globe rupture	10	23.8

Table 6: Distribution of patients according to ocular injuries.

Regarding management, 29 patients (69%) received medical treatment, while 13 patients (31%) underwent surgical intervention (Table 7).

Post-Treatment Sequelae	Number of Cases	Percentage
Traumatic cataract	6	14.3
Phthisis bulbi	5	11.9
Corneal opacity (nebula)	3	7.1
Optic atrophy	3	7.1
Pupillary seclusion	3	7.1
Retinal detachment	2	4.7
Vitreous degeneration	2	4.7
Ocular hypertension	1	2.4
Retractile eyelid scar	1	2.4
Adherent leucoma	1	2.4

Table 7: Distribution of patients according to post-treatment sequelae.



Figure 2: An 8-year-old patient presented with a corneoscleral laceration and total hyphema in the left eye following a play-related accident. The traumatic agent was a screwdriver.



Figure 3: A 10-year-old patient presented with a ruptured left eyeball following a cooking practice accident. The traumatic agent was a knife.



Figure 4: A 6-year-old patient presented with a corneoscleral laceration and iris prolapse in the left eye following a play-related accident. The traumatic agent could not be definitively identified by the parents.

Discussion

In our study, children aged 6 to 10 years were the most affected by ocular trauma caused by sharp weapons, representing 47.6% of cases. This finding is consistent with previous literature indicating that children in this age group are particularly vulnerable to ocular injuries [14,15]. The high frequency of sharp-object-related ocular trauma in this age group can be attributed to the same factors underlying most pediatric ocular injuries. Between the ages of 6 and 10, children gain greater mobility and independence from their parents, often evading adult supervision. This period also corresponds to a developmental stage in which children are eager to explore and engage with their environment. However, at this age, they often lack coordination and may display a lack of awareness regarding potential dangers. In contrast to our findings, Makita in Congo reported a higher frequency of trauma among children aged 11 to 15 years, accounting for 47% of cases [16].

Males were more frequently affected, representing 64% of cases with a sex ratio of 1.77. Our results are similar to those reported by Beby and Hudat, who found male predominance at 71.9% and 77.4%, respectively [17,18]. Similarly, Ozlem observed a male predominance of 74.8% [19]. These findings suggest that boys are more prone to ocular trauma due to their more active and risk-taking behavior. They are often involved in high-risk activities such as aggressive sports and dangerous games. In some settings, boys are frequently unsupervised in public spaces, increasing their exposure to hazards, whereas girls of the same age are more likely to be engaged in household chores under adult supervision. Furthermore, boys are more commonly present in construction sites or informal apprenticeship workshops without adequate personal protective equipment. Another contributing factor is that boys are often required to assist adults in agricultural work, where they handle sharp tools without sufficient skill or training.

The majority of affected children in our series were enrolled in school (64%), a finding consistent with Ouedraogo, who reported a 69% school enrollment rate among injured children [11]. This suggests that even school-going children are not spared from sharp-object accidents, which may occur during school recess or while traveling to and from school-times when children are often unsupervised.

In our series, most traumas occurred at home (47.6%), followed by rural environments and apprenticeship workshops, accounting for 11.9% and 4.8%, respectively. These results are comparable to those reported by Beby, et al., in France and Liamein, et al., in Tunisia, who found domestic accidents to be predominant, at 56% and 79.6%, respectively [17,20]. The high incidence of home injuries may be explained by parents' inability to constantly supervise their children, compounded by the increasing distraction caused by screen-based devices (computers, smartphones, tablets). Parents are often absorbed in their devices and may fail to prevent hazards, even when children are nearby. In this context, ocular injuries involving sharp objects

can easily occur. In the Caribbean, Mowatt, reported that 50% of ocular injuries in girls occurred at home, primarily because girls are more frequently exposed to knives and other sharp or pointed tools during household chores [21]. Conversely, other studies have reported playgrounds as the most common location for pediatric ocular trauma [14,15,22].

Regarding the circumstances of injury, play-related accidents were the most frequent in our series (42.8%), despite most incidents occurring at home. Work-related accidents and fights each accounted for 9.5% of cases. Our data align with findings from Koki in Cameroon and Makita in Congo, who identified play as the most common context, with frequencies of 48.84% and 50%, respectively [7,16]. Other studies have also reported play as the leading cause of pediatric ocular injuries [5,20]. In contrast, a U.S. study found that fights were the most frequent circumstance, accounting for 53.68% of cases [23]. In our study, punitive corporal punishment was reported in only a small number of cases, unlike other studies where higher rates of such practices were noted as causes of ocular injury in children [24-26]. In 19.1% of cases, the circumstances of the injury could not be determined. This rate is lower than those reported by Mowatt and Lama, who found unspecified circumstances in 25% and 32.2% of cases, respectively [21,27]. The lower rate in our series may reflect the fact that most injuries occurred at home, where the context is more likely to be known. In other settings, children may remain silent due to fear of parental reprisal.

Regarding the causative agents, the knife was the most common (16.7%), followed by machetes and pointed tools (14.3% and 9.5%, respectively). These results differ significantly from those of Mowatt and Sadia, who reported knives as causative agents in only 2.8% and 2.3% of cases [21,28]. This discrepancy is likely due to our study's exclusive focus on sharp weapon-related trauma. In South Africa, wire with metal strings (e.g., "cat's cradle" toys) was the leading cause, accounting for 46% of cases [29]. In Hong Kong and Malaysia, metal household items caused 22% and 15.2% of injuries, respectively [30,31]. These findings highlight that dangerous objects capable of causing ocular trauma are commonly found in homes and pose a real threat to children. In Cameroon, Eballe identified projectiles as the most frequent cause (18%). In our series, a notable proportion (21.4%) of cases involved an unidentified causative agent—a rate similar to Sadia's finding of 17.2% [28,32]. In severe cases, parents may rush to the hospital in panic without identifying the object involved. Additionally, children may hide the object out of fear of losing access to it, especially if it was a toy.

The majority of our patients (62.3%) sought medical care within 48 hours of the injury. This is consistent with other studies reporting that most patients presented between 24 and 48 hours post-trauma [16,22,33]. While this delay is relatively short, it still allows time for complications such as infections to develop. Ideally, patients should be seen on the same day of injury, as reported by Beby, where 78.9% of patients were evaluated immediately [17]. In contrast, some studies have reported longer delays ranging from four days to a week due to factors such as distance to healthcare facilities, reliance on traditional medicine or financial constraints [11,15].

At admission, the most common visual acuity category was no light perception (26.2%), indicating the severity of ocular injuries. Another 26.2% of patients could not have their visual acuity measured. This inability to assess vision may stem from young children's lack of cooperation due to age, pain or photophobia. A Malaysian study also reported a high rate (42.2%) of unmeasurable visual acuity upon admission, with 24.2% of patients having no light perception [31].

At the time of healing, 26.2% of patients in our series still had no light perception, while vision could not be assessed in 11.9%. Other studies have reported similarly poor outcomes: in Guinea, 17.2% of patients had visual acuity below 2/10 at the end of treatment in Congo, 65% had acuity below 1/10 post-treatment and in Malaysia, 21.1% of children were declared blind in the injured eye after recovery, with 54.5% having unmeasurable acuity [16,27,31]. These high rates of poor visual outcomes—even after healing—reflect the severe damage caused by sharp weapons in pediatric ocular trauma.

In our series, subconjunctival hemorrhage was the most common adnexal injury (71.4%). In the anterior segment, corneoscleral laceration with iris prolapse was the most frequent lesion (31%), followed by globe rupture (23.8%). Makita similarly reported corneoscleral laceration with iris prolapse as the most common injury (42.2%) and globe rupture in 10.1% of cases [16]. Other African studies have also documented a predominance of corneoscleral wounds [27,34]. The high incidence of open-globe injuries is attributable both to the force of impact and the nature of the causative agents sharp objects capable of penetrating the eyeball.

More than one-third of our patients underwent surgical treatment. The surgical rate in our series is lower than those reported by Koffi (46.25%) and Diallo (72%). Surgical management was always combined with medical treatment, including anti-inflammatory and anti-infective agents and sometimes mydriatics, to reduce inflammation, prevent infection and avoid anterior or posterior synechiae [5,25]. At healing, traumatic cataract was the most common sequela, affecting 14.3% of patients. Phthisis bulbi occurred in 11.9% and corneal opacity in 7.1%. The literature reports anatomical sequelae in up to 54.8% of children following ocular trauma [15]. Some authors have reported higher rates of corneal opacity than observed in our study [27,36].

Conclusion

Pediatric ocular trauma caused by sharp weapons is potentially severe and frequently occurs within the home environment. Knives and other sharp or pointed objects are most commonly involved. Sequelae such as traumatic cataracts and corneal opacities are common after healing and may significantly impair functional visual outcomes. Preventive measures targeting these injuries could play a crucial role in reducing the burden of monocular blindness in children.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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