Epidemiology of Childhood Ocular Trauma in a Northeastern Colombian Region

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Objective: To describe the epidemiology of ocular trauma in children 15 years and younger who underwent evaluation during a 5-year period in the emergency department of a tertiary referral center in northeastern Colombia.

Methods: We retrospectively reviewed the medical records of children 15 years and younger. Records of 393 children with 415 incidents of eye injury were included in the study, of whom 22 were initially treated for bilateral ocular trauma.

Results: Most patients (64.9%) were boys. The highest proportion of injuries (44.4%) occurred at home, followed by streets and roads (28.6%). Blunt (35.1%) and sharp (22.6%) objects represented the most frequent causes of trauma. Closed-globe injuries were far more frequent than open-globe injuries for boys (82.4% vs 17.6%) and girls (83.8% vs 16.2%). Of those with closed-globe injuries, 253 injuries (80.0%) registered an initial visual acuity of greater than 20/60, whereas 31 open-globe injuries (52.5%) registered an initial visual acuity of less than 20/400. Most closed-globe injuries (223 [92.1%]) did not cause any final visual impairment in the affected eye, whereas 26 open-globe injuries (55.3%) caused severe visual impairment or blindness.

Conclusions: Most of the accidents reported in this study could have been avoided; the data demonstrate a clear need for primary prevention and control measures.

Arch Ophthalmol. 2003;121:1439-1445

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The authors have no relevant financial interest in this article.

EYE INJURIES are a major and underrecognized cause of disabling ocular morbidity that especially affect the young. The public health importance of such ocular trauma is undeniable. Injuries generate a significant and often unnecessary toll in terms of medical care, human suffering, long-term disability, productivity loss, rehabilitation services, and socioeconomic cost.[1,2] However, nearly 90% of eye injuries can be prevented by relatively simple measures.[3,4]

Eye injuries are the leading cause of monocular blindness today. Globally, more than 500 000 blinding injuries occur every year. Approximately 1.6 million people are blind owing to ocular trauma, 2.3 million are bilaterally visually impaired, and 19 million have unilateral visual loss.[2] In the United States, work- and leisure-related accidents, sports injuries, motor vehicle crashes, assault, and other varied mishaps each year account for more than 2.5 million eye injuries, second only to cataract as the most common cause of visual impairment.[1,2,5,6] It is estimated that 500 000 years of lost eyesight occur annually nationwide, and injury is the most important cause for eye-related hospital admissions.[1,2] Although the overall financial cost derived from ocular injuries can only be estimated, direct and indirect costs combined run into hundreds of millions of dollars per year. Developing countries carry the heaviest burden, and they are the least able to afford the costs.[6]

Available information regarding the distribution and magnitude of ocular trauma in developing countries is very scarce, and the existing data are difficult to interpret because reporting is extremely poor and especially because of the completely different settings of the occurrence of ocular trauma.[2] Among other factors, underreporting and lack of standardized forms and national integrated databases make assessment of the current picture and comparisons within and across countries practically impossible. In addition, developing countries often lack adequate infrastructure for persons with eye injuries to reach a primary care center, when one exists, and the lack of awareness of preventive measures and/or immediate actions increases the risk for

Table 1. Demographic Characteristics of 393 Children With Ocular Trauma, 1996-2000

Characteristic	No. (%)*
Age, y	
0-5	143 (36.4)
6-10	135 (34.4)
11-15	115 (29.3)
Sex	
Boys	255 (64.9)
Girls	138 (35.1)
Health insurance	
Yes	217 (55.2)
No	176 (44.8)
Area of residence	
Urban	316 (80.4)
Rural	77 (19.6)

*Percentages have been rounded and may not total 100.

complications and consequent visual disability and blindness.[7] Such circumstances are common in Colombia and other Latin American countries, where the absence or misuse of safety eyewear, lack of reinforcement of seatbelt use and other motor vehicle safety features, common lack of child supervision by parents, and the increased risk for personal lesions due to violence further exacerbate this health problem.

Worldwide, ocular trauma is an important cause of eye morbidity and a leading cause of noncongenital monocular blindness among children.[8-12] Children are disproportionately affected by ocular injuries. In the United States, a population-based study reported an annual incidence of ocular trauma in children of 15.2/100 000.[10]

In general, males are more frequently reported to have eye injuries than females.[6,7,9-13] Results varied across studies regarding the age-specific frequency of eye injuries,[9-15] with some reporting a higher incidence in older children and others in younger children. A study conducted among Brazilian children found that the group aged 0 to 5 years was at greatest risk, regardless of sex, and that among those older than 5 years, eye injuries were more frequent in boys.[15]

In Colombia, no current data are available to accurately assess the magnitude of ocular trauma in children in terms of frequency and distribution or in visual, social, and economic impact. The purpose of this study is to describe the epidemiology of ocular trauma in children 15 years and younger who underwent evaluation in the emergency department of the Fundación Oftalmológica de Santander, in Bucaramanga, capital of Santander, a state located in the northeast part of Colombia, during a 5-year period. This study examines the frequency and causes of ocular trauma in these young patients and the underlying factors related to occurrence of this trauma, and presents specific recommendations for the establishment of primary prevention measures.

METHODS

We retrospectively reviewed the medical records of all children 15 years and younger who were treated at the Fundación Oftalmológica de Santander emergency department from January 1, 1996, through December 31, 2000. The institution is part of a teaching hospital and tertiary referral center for Colombia's northeast, east, and southeast regions. Records of all cases were reviewed in detail, and a standardized form was used to extract the data, including the following variables: demographic information, date of injury, mechanism and type of injury, initial and final visual acuity, location and extent of injury on the basis of the ocular structures involved, causative object/agent of injury, circumstances surrounding the event (ie, place, activity during the episode, and presence of an adult), primary diagnosis, treatment, complications, visual outcome, and functional and anatomical sequelae. The month of injury was tabulated to identify possible seasonal variations. Preexisting ocular and personal conditions such as severe visual impairment or psychomotor development disabilities that might act as influencing factors in the occurrence of the injury also were included. Prognostic variables of final visual outcome included in the standardized data collection form were based on the Ocular Trauma Classification Group guidelines[16] and the Birmingham Eye Trauma Terminology.[16,17] On the basis of the Birmingham Eye Trauma Terminology system by Kuhn et al,[17-19] open-globe injury types were classified as rupture, penetrating, intraocular foreign body, perforating, and mixed; closed-globe injury types, as contusion, lamellar laceration, superficial foreign body, and mixed.

Visual acuity was measured whenever possible according to the patient's age and collaboration during the examination. Preschool patients were examined using the fixation and follow-test patterns. School-aged children's visual acuity was measured at a distance of 6 m (20 ft) using the Snellen chart, and near vision was assessed with the Rosenbaum card, with correction and pinhole when appropriate. Any variable information inadequately described or absent in the medical record was recorded as "no registry" in the database.

We performed data analysis using SPSS software, version 10.1 (SPSS Inc, Chicago, Ill), and χ^2 statistics for 2×2 tables, and contingency tables were generated. The denominators for initial and final visual acuity and place of the event do not equal the total number of patients in the study, because in some cases this information was not documented in the medical record.

RESULTS

During the 5-year study, medical records of 393 children with 415 incidents of eye injury were reviewed, of which 22 presented with bilateral ocular trauma. **Table 1** presents the demographic characteristics of the study subjects. Ages ranged from 0 to 15 years. Less than 71% of the patients were 10 years or younger. The mean age was 7.78 years (SD, 4.25 years), and the median age was 7.0 years. A χ^2 analysis showed that the prevalence of ocular trauma was not significantly different across the age groups.

Similarly as reported elsewhere in the literature, most children in the study were boys (64.9%), with a general male-female ratio of 1.8:1; this was significant at $P < .001$. The highest male-female ratio of ocular trauma was found in the higher age group (11-15 years), with a frequency of 2.5 boys with eye injuries for every girl. The youngest group (0-5 years) showed a considerably lower ratio of 1.6:1 (**Figure 1**). Among all children, 55.2% had some type of health insurance and 80.4% resided in an urban area ($P < .001$).

In terms of location of children at the time of injury (**Figure 2**), the highest proportion of eye injuries (44.4%) occurred at home, followed by streets and roads with 28.6%. School or child care facilities and country-

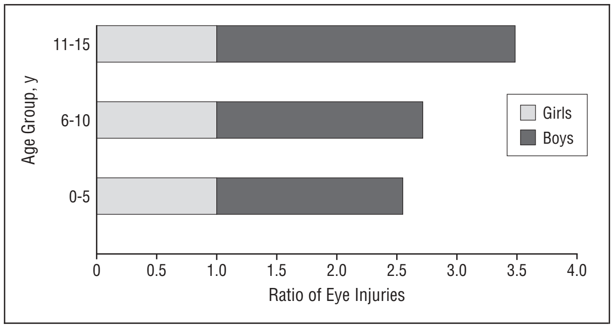

Figure 1. Male-female ratio of eye injuries by group.

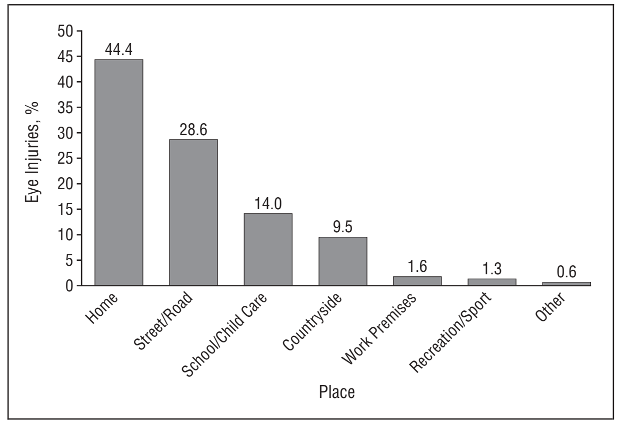

Figure 2. Location of children at the time of injury.

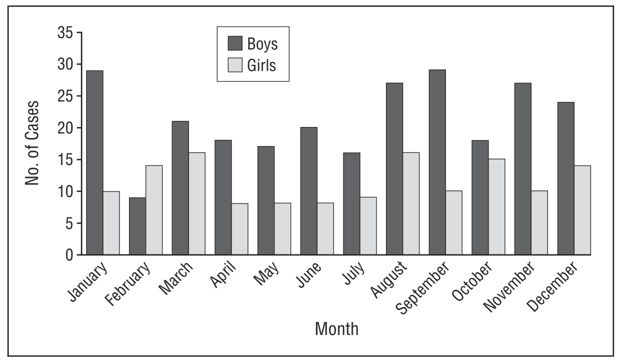

Figure 3. Monthly distribution of eye injuries by sex (1996-2000).

side came next with 14.0% and 9.5%, respectively. Work premises and recreation or sport settings were last, with small but similar proportions of 1.6% and 1.3%, respectively. Differences of eye injuries by place of the event were significant at $P<.001$. In the group aged 11 to 15 years, 5 children were working when the ocular trauma occurred.

More than half of the children were alone or without adult supervision when the ocular trauma occurred (52.8%; $P<.001$). The distribution by age group showed that 63.3% of children aged 6 to 10 years, 58.1% aged 11 to 15 years, and 40.0% aged 0 to 5 years were alone or without adult supervision at the time of the eye injury ($P<.001$).

Figure 3 illustrates the distribution of ocular trauma by month during the 5-year study. Clusters in November, December, and January and in August and September stand out with the highest number of eye injuries, especially in boys, suggesting a seasonal variation. A possible explanation for the first identified cluster is that children are generally out of school during November, December, and January. In addition, during this quarter and owing to Christmas and New Year's holidays, access to fireworks for private use is common and unrestricted, a situation that has gradually changed after the study period. Children also spend more time outside playing with friends and neighbors, with less adult supervision. Although schools also have a mid-year vacation period during June and July, our study shows a higher cumulative frequency of eye injuries during August and September. When analyzing these results by type of referral, it appears that the peak during these 2 months may be explained by a higher number of referrals in August and September from particular health insurance companies, artificially creating a seasonal occurrence. As a result of health care reform, contracts are usually short term and vary by year. Results of χ^2 analysis showed that the observed seasonal variation was not statistically significant.

Table 2 presents the most common causes of ocular trauma in the study cases. For boys and girls, blunt (35.1%) and sharp (22.6%) objects represent the most frequent causes of eye injury, followed by fireworks (6.9%); sand, dust, and wood particles (6.6%); and chemicals (5.1%) ($P<.001$). Although sex differences were found in the frequency distribution of ocular trauma causes, these were not statistically significant, but somehow suggestive of an association ($P=.054$). For boys, sand, dust, and wood particles (7.8%), fireworks (7.1%), and metal particles (3.9%) were the next most frequent causes after blunt and sharp objects, whereas for girls the next most frequent causes were chemicals (8.7%), fireworks (6.5%), and sand, dust, and wood particles (4.3%).

Table 2. Cause of Injury by Sex

	No. (%) of Children*		
Cause of Injury	**Boys**	**Girls**	**Total**
Blunt	93 (36.5)	45 (32.6)	**138** (35.1)
Sharp	60 (23.5)	29 (21.0)	**89** (22.6)
Sand, dust, or wood particle	20 (7.8)	6 (4.3)	**26** (6.6)
Fireworks	18 (7.1)	9 (6.5)	**27** (6.9)
Metal particle	10 (3.9)	1 (0.7)	**11** (2.8)
Chemical	8 (3.1)	12 (8.7)	**20** (5.1)
Animal	8 (3.1)	2 (1.4)	**10** (2.5)
BB pellet gun	5 (2.0)	1 (0.7)	**6** (1.5)
Motor vehicle crash	4 (1.6)	4 (2.9)	**8** (2.0)
Cigarettes	3 (1.2)	3 (2.2)	**6** (1.5)
Falls	3 (1.2)	5 (3.6)	**8** (2.0)
Branches/plant	2 (0.8)	5 (3.6)	**7** (1.8)
Other	20 (7.8)	15 (10.9)	**35** (8.9)
Unknown	1 (0.4)	1 (0.7)	**2** (0.5)
Total	**255** (100.0)	**138** (100.0)	**393** (100.0)

*Percentages have been rounded and may not total 100.

The most common blunt objects, in decreasing order of frequency, were wood sticks, stones, metal sticks, hands and fists, fingers, and balls. The most often reported sharp objects, in decreasing order of frequency,

Table 3. Open-Globe Injuries by Sex

Type of Injury	No. (%) of Injuries*		
	Boys	Girls	Total
Rupture	0	3 (12.5)	**3** (4.2)
Penetrating	37 (78.7)	19 (79.2)	**56** (78.9)
Intraocular foreign body	9 (19.1)	1 (4.2)	**10** (14.1)
Perforating	1 (2.1)	1 (4.2)	**2** (2.8)
Mixed	0	0	**0**
Total	**47** (100.0)	**24** (100.0)	**71** (100.0)

*Two children sustained bilateral injury. Percentages have been rounded and may not total 100.

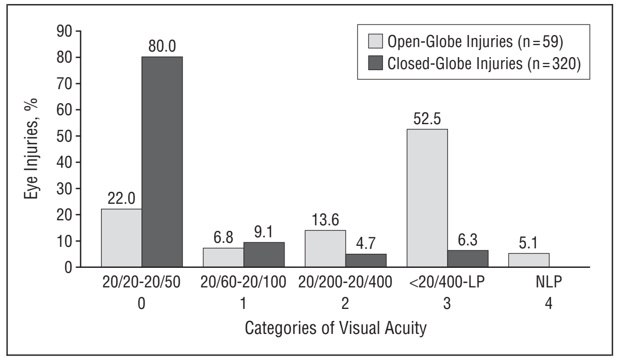

Figure 4. Initial visual acuity by type of injury. LP indicates light perception; NLP, no light perception.

Table 4. Closed-Globe Injuries by Sex

Type of Injury	No. (%) of Injuries*		
	Boys	Girls	Total
Contusion	77 (35.0)	34 (27.4)	**111** (32.3)
Lamellar laceration	87 (39.5)	62 (50.0)	**149** (43.3)
Superficial foreign body	48 (21.8)	20 (16.1)	**68** (19.8)
Mixed	8 (3.6)	8 (6.5)	**16** (4.7)
Total	**220** (100.0)	**124** (100.0)	**344** (100.0)

*Twenty children sustained bilateral injury. Percentages have been rounded and may not total 100.

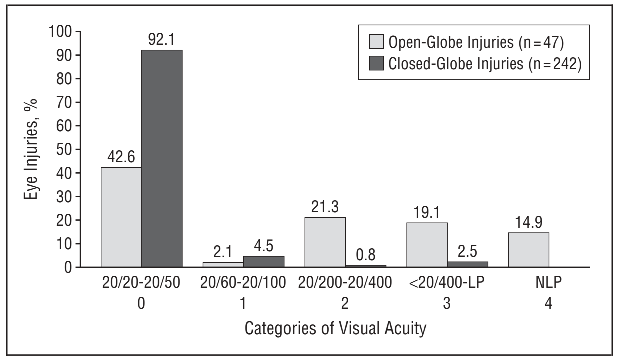

Figure 5. Final visual acuity by type of injury. LP indicates light perception; NLP, no light perception.

were pencils and pens, metal wires, fingernails, pieces of glass, splinters of wood, needles, and machetes.

Of the total number of eyes injured, 10.6% were bilateral, with fireworks, acids, and sand as the most frequent causes of trauma. In this group of bilateral injuries, firearms and a grenade explosion were also registered causes. As shown in **Table 3** and **Table 4**, closed-globe injuries were far more frequent than open-globe injuries for boys (82.4% vs 17.6%) and girls (83.8% vs 16.2%). The most common types of closed-globe injuries were lamellar laceration (43.3%), contusion (32.3%), and superficial foreign body (19.8%). No significant differences were found by sex. The most frequent types of open-globe injuries were penetrating injuries (78.9%), followed by intraocular foreign body (14.1%) and rupture of the eyeball (4.2%). Differences by sex were statistically significant at $P=.03$. All of the rupture cases occurred in girls, involving a grenade explosion, bottle explosion, and metal stick.

For the present study, visual acuity was classified as category 0 (20/20 to 20/50; no visual impairment), category 1 (20/60 to 20/100; moderate visual impairment), category 2 (20/200 to 20/400; severe visual impairment), category 3 (<20/400 to light perception), and category 4 (no light perception; blindness). Initial and final visual acuities are represented in **Figure 4** and **Figure 5**. After excluding those patients (n=36) whose visual acuity was not recorded or who did not cooperate during the examination, the initial visual acuities for closed-globe injuries were 256 injuries (80.0%) in category 0, 29 (9.1%) in category 1, 20 (6.3%) in category 3, and 14 (4.7%) in category 2. For open-globe injuries, 31 injuries (52.5%) were in category 3, 13 (22.0%) in category 0, 8 (13.6%) in category 2, 4 (6.8%) in category 1, and 3 (5.1%) in category 4 (amaurosis) ($P<.001$).

To evaluate the final visual acuity (6 months after injury), those patients (126 children) with information that was not recorded or with poor follow-up data were also excluded. As expected, in accordance with the severity of the injuries, severe visual impairment and blindness were caused mainly by open-globe injuries. Most closed-globe injuries (92.1%) were not severe and did not cause any visual impairment. Still, 4.5% of these injuries caused moderate impairment; 2.5% caused blindness; and 0.8% caused severe visual impairment ($P<.001$). Falls, fireworks, chemicals, and blunt trauma with bicycles were the main objects causing the 6 cases of blindness. Fireworks were involved in the 2 cases of severe visual impairment.

The situation was less fortunate with open-globe injuries. More than half of those caused a grade of visual impairment or blindness. In fact, 34% of open-globe injuries caused blindness (15 children, with 1 bilateral case); 21.3% caused severe visual impairment (9 children, with 1 bilateral case); and only 2.1% caused moderate limitation (1 child). Objects involved in open-globe injuries resulting in blindness included machetes, metal particles, fireworks, explosive material, a grenade, a needle, a nail, sticks, pieces of glass, a heron beak, and a piece of sharp stone. The cases of severe visual impairment involved pencils, wires, pieces of glass, fireworks, a firearm (bilateral), a knife, and a BB pellet gun.

Early diagnosis, referral, and treatment are among the factors associated with visual prognosis of eye injuries. Another key factor is appropriate medical management before ophthalmologic care of those cases in which the first examination is performed by a general physician or other health care professional. In the present study, 73.7% of children were examined within the first 24 hours of their injury (87.5% with closed-globe injuries and 12.5% with open-globe injuries), whereas 26.3% were examined more than 24 hours after trauma (71.0% with closed-globe injuries and 29.0% with open-globe injuries). The main reasons cited for delay in seeking medical attention were distance (40.5%), money (22.0%), negligence (19.7%), delayed referral (10.6%), and no symptoms (9.1%).

In the study cases, 22.6% of patients underwent surgery, whereas 77.4% did not require any surgical procedures. For those with closed-globe injuries who needed surgical treatment (30 cases [9.3%]), most procedures were related to the periorbital structures or the ocular surface and included sutures of the conjunctiva, sclera, eyelid, and lacrimal apparatus. Occurring with less frequency but indicating that the eye suffered a significant injury were cases in which structures of the anterior chamber were involved and required anterior chamber washing for hyphema and phacoemulsification with intraocular lens implantation for traumatic cataract. An open eye should be repaired as soon as feasible, and closure of a rupture or a penetrating wound should always be attempted, even in an apparently disrupted eye. However, 10 (14.5%) of the individuals in the study with open-globe injuries delayed seeking medical attention and did not undergo surgery because of a self-sealing injury or phthisis bulbi (6 children) or because they never returned for surgery (4 children). The remaining 59 children (85.5%) received surgical treatment, with 29 (49.2%) of those requiring more than 1 surgical procedure, including but not limited to corneoscleral sutures, phacoemulsification with and without intraocular lens implantation, intraocular foreign body extractions, scleral buckling, posterior vitrectomies, and intravitreous injection of antibiotics. Unless a multidisciplinary intervention is required (eg, plastic surgery or neurosurgery), or unless systemic medication is needed (eg, for a severe infection), the institutional standard is to manage the surgical cases without hospitalization.

COMMENT

This 5-year retrospective study focuses on the epidemiology of eye injuries in children 15 years and younger who underwent evaluation at the emergency department of the Fundación Oftalmológica de Santander. It describes their frequency, distribution, causes, and the underlying factors related to their occurrence and presents specific recommendations for the establishment of primary prevention measures.

In general, children are more susceptible to eye injuries because of their immature motor skills, limited common sense, tendency to imitate adult behavior without evaluating risks, lessened emotional control, relative ignorance, and natural curiosity. Although most eye injuries are avoidable by simple prevention measures, many children suffer visual impairment that can seriously hamper their psychosocial development. They face a lifetime of limited vision or even blindness, with all the associated emotional, social, and economic cost to the child, family, and society.

As reported by others,[10,12-15,20-22] in the present study boys outnumbered girls in the frequency of eye trauma with a general ratio of 1.8:1. This rate is almost doubled in the group aged 11 to 15 years. In the Latin culture, as well as in most other societies, boys are generally granted more liberty than girls, and they tend to spend more time outside.[15] They are allowed and even encouraged to exhibit more competitive and aggressive behavior as part of their normal characteristics. School-aged children in particular are more often exposed to the environment and tend to be more physically active and to take more risks to gain acceptance by their peers. This is reflected in the types of games they play and how they respond to conflictive situations.

The present study found that a higher frequency of ocular trauma occurred in homes, which underscores the great need for primary prevention programs targeting parents and the home environment. The second-highest frequency occurred in streets and roads; the third, in schools and child care facilities. When looking at the distribution by age groups, the frequency by locale differed for children in the older age group,[11-15] for whom streets and roads were the first, schools the second, and home the third most frequent locations.

Adult supervision has been found to be an important factor in the prevention of accidents, and the presence of an alert adult is of great value in preventing eye injuries in children.[15] Despite the knowledge that children, and infants in particular, should be supervised at all times, a higher proportion of youth from all age groups in the present study were alone or without adult supervision at the time of the event (52.8%), creating a risk situation for a possible accident.

It is not unusual for small children to play with hazardous objects such as needles, knives, glasses, and pencils left within their reach by parents and supervising adults or older children who are not instructed about the dangers these objects pose. Also, children often are allowed to observe adult activities that may pose a risk to them (eg, working with dangerous tools). In the case of girls, it is not uncommon to help with housecleaning chores using hazardous chemicals and products that may cause severe burns and should always be handled with extreme care. This suggests a general lack of awareness and, in many cases, neglect with regard to the dangers that certain objects and activities represent for children.

Environmental circumstances also play an important role in Colombia. Many children must work to help support their families and are exposed to dangers in their work environment, where proper eye protection typically is not provided. Smoking is common in many homes and other public environs, where at times children are unintentionally struck in the eye by cigarettes. There is no public or legal control of firework use, which is very common during the Christmas season and other religious and political festivities. Small children often travel in the front seat of cars, and use of seatbelts is not rigorously enforced. In addition to these already critical environmental factors, the violence that is prevalent in specific regions and, indeed, the entire country generates additional risks because its victims are frequently children. All of these circumstances are reflected in the wide range of causative factors contributing to the eye injuries found in the present study (Table 2) and may at least partially explain the sex differences that were seen.

The type of injury, its severity, and the initial visual acuity are known prognostic factors of the final visual outcome. Most cases were not severe closed-globe injuries and did not cause any initial visual impairment; more than 90% of these cases were found to have a final visual outcome in this category. However, in 6 cases, closed-globe injuries primarily caused by falls, fireworks, and chemicals resulted in blindness. Open-globe injuries registered the most severe cases, with more than half causing blindness at the initial examination. Less than half of all cases had a final visual acuity of 20/20 to 20/50 (no visual impairment), whereas more than 55% of injuries caused severe visual impairment or blindness, with all the psychosocial, emotional, and economic implications that this condition places on the child, family, and society.

The visual prognosis of eye injuries also improves greatly when prompt examination, diagnosis, and repair are provided. However, socioeconomic, geographic, cultural, and system factors may keep patients from receiving timely specialized attention and consequently hamper their visual prognosis. More than 26% of children in the study received medical attention more than 24 hours after injury, and more than half of those cases received the needed ophthalmic care 96 hours after injury. Almost a third of the delays were due to negligence and ignorance, underscoring the need for increased awareness and education. Appropriate management by general physicians before ophthalmologic consultation is another key factor in improving the visual prognosis, providing an opportunity for secondary prevention. Proper training of general practitioners should be encouraged to provide adequate medical management of eye injuries, recognize the severity of the trauma, and refer patients as soon as possible.

This study is limited by its retrospective nature. Since medical records are not completed in a standardized manner, recording bias may cause underreporting of specific findings. Because the institution in which the ocular trauma data were collected is a tertiary referral center, some children continued their follow-up with their primary physicians. Although we were limited to use of the last recorded visual acuity in the medical record, the visual acuity of some patients may have improved after the last recorded data. Also, because the institution is a referral center, more severe injuries that needed transfer to a tertiary-level center may be present. Since no data are available on those cases that were not referred, it is impossible to determine whether any differences exist.

The data presented in this study regarding the circumstances surrounding ocular trauma and the factors associated with it demonstrate a clear need for primary prevention and control measures. Most of the accidents could have been avoided if simple prevention measures had been in place. Education targeting parents, schoolteachers, and children regarding hazardous objects and toys, dangerous activities, the devastating effects of eye injuries, and preventive measures is urgently needed to reduce the incidence of ocular trauma and its consequences. Specific recommendations for home safety, avoidance of hazardous toys and furniture, and close supervision of play activities by parents and caretakers should be emphasized.

Strictly enforced regulations are needed for the use of fireworks and automobile seatbelts. The public sale of fireworks for private use should be prohibited altogether. Policy makers should be involved in this initiative to encourage, as an alternative, the availability of public fireworks displays conducted and controlled by knowledgeable adults. Seatbelt use also should be enforced, particularly for young passengers, and small children should be required to ride in the back seat in a properly maintained and adjusted child safety seat.

Ophthalmologists, pediatricians, nurses, social workers, and other professionals involved in the health care of children play an important role in increasing awareness of problems involving eye safety among their patients, families, and the community. Efforts should be made to engage professionals in wide-ranging health care occupations in a public health campaign focused on the risks for eye injuries, particularly among youth.

Finally, it is very important that the registry of eye injuries be standardized. After this study concluded, new protocols and procedures were institutionalized following the United States Eye Injury Registry formats. Training for residents and general physicians is now under way, with an emphasis on the importance of accurate and complete data in the creation of prevention programs and control measures, and with monitoring of their efficacy. Without the availability of standardized and complete data, it is impossible to conduct comparison studies, evaluate surgical procedures and treatments, or further investigate and control this important public health problem.

Submitted for publication October 1, 2002; final revision received Februray 18, 2003; accepted February 24, 2003.

We thank Dani Presswood for assistance in the preparation of this article.

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Ophthalmological Numismatics

Benjamin Franklin (1706-1790), statesman, scientist, and inventor, was born in Boston, Mass. He established himself in the printing business in Philadelphia, Pa, which is where he became involved in politics and science. While serving as the US ambassador to France, he invented bifocal spectacles in 1784.

The firm Bausch and Lomb, commemorating the 150th anniversary of this invention in 1934, issued a medal of Franklin holding a pair of his bifocal spectacles. It was engraved by Felix Weil and created by the firm Medallic Art Co (**Figure 1** and **Figure 2**).

The Benjamin Franklin half dollar (**Figure 3**) was struck by the US Mint for circulation from 1948 to 1963. It was designed by the engraver John R. Sinnock, whose initials appear below the shoulder. The reverse, **Figure 4**, shows the Liberty Bell.

Courtesy of: Jay M. Galst, MD, 30 E 60th St, New York, NY 10022.

Figure 1.

Figure 2.

Figure 3.

Figure 4.