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Pattern and Outcome of Paediatric Ocular Trauma – A 3-Year Review at National Eye Centre, Kaduna

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SUMMARY

Aims and Objectives: To describe the pattern of paediatric ocular trauma seen at the National Eye Centre, Kaduna, between January 1995 and December 1997; and the factors that affect the visual and ocular outcome.

Materials and Methods: The medical records of all the children 15 years or younger, with ocular injuries presenting as emergencies within the 3-year period, were reviewed. Relevant information obtained formed the database for analysis using EpiInfo 6. Overall *P* value for predictors of visual and ocular outcome was determined.

Results: One hundred and thirty-seven children, 13.4% of all paediatric attendance, presented with ocular injuries. The male to female ratio was 2:1. Only 22% of the patients presented on the day of injury. Fifty-three (38.7%) had penetrating injury, while 45(32.9%) had contusion injury. About half occurred while at play and a quarter occurred as home accidents. Eighty patients (58.4%) needed hospital admission, 29(21.2%) were treated on outpatient basis and 28(20.4%) were lost before treatment was commenced. Sixty-five percent of the admitted patients stayed longer than seven days in the hospital. Seventy-one eyes (67.6%) were blind at presentation while 62%(39) of those tested at last hospital visit remained blind. Good final visual acuity (VA) was related to good initial VA and non-penetrating injury. Poor final VA was related to poor initial VA, injury to multiple ocular structures and penetrating injury. Poor ocular outcome (evisceration and phthisis) was related to penetrating injury, injury to multiple ocular structures and evidence of infection at time of presentation.

Conclusions: Ocular trauma in children is a common cause of hospital attendance. They often result in severe visual deficit and there is need for adult supervision of children at play and control measures to prevent them. There is need to encourage early presentation and shielding of injured eyes.

KEY WORDS: ***Eye injury; childhood; outcome; avoidable; management.***

INTRODUCTION

Ocular injuries in children still continue to cause severe visual deficit despite improvement in management modalities. They do not feature in blindness prevalence data[1] because ocular injuries characteristically occur in only one eye (98% cases)[2] and become a major cause of monocular blindness[1,3,4]. Children, particularly, are at risk of ocular injury because of decreased ability to detect or avoid hazards, and/or lower likelihood of functional recovery following eye injury[5].

Various reports on ocular trauma in Nigeria have highlighted its pattern. One had studied injuries separately in children[6]. Most of these injuries are avoidable because they largely occur while children are at play or at home settings.

Time elapsed between injury and treatment, severity and type of injury, and initial visual acuity are prognostic indicators of final visual outcome and ocular survival. A better understanding of these predictors would enable us to formulate guidelines for management and provide informed consent for surgical treatment.

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With recent surgical advances, sepsis control, improved understanding of ocular trauma pathophysiology and increased accessibility to a health facility, visual/ocular outcome is expected to improve.

This paper retrospectively reviews paediatric ocular trauma seen at National Eye Centre, Kaduna over a 3-year period and determines the changing trends and the factors, including treatment, that affect the visual outcome and ocular survival.

MATERIALS AND METHOD

A review of medical records at the National Eye Centre, Kaduna, identified 137 children 15 years old or younger with ocular injuries presenting as emergencies within the 3-year period January 1995 to December 1997. Relevant information obtained was transferred onto a questionnaire, which formed the database for analysis using EpiInfo 6. Overall *P* value for predictors of visual/ocular outcome was determined.

The pathology was broadly classified according to the ocular trauma classification proposed by Kuhn and associates[7].

Mechanical Eye Injury:

1. *Closed Globe:*
   a) Contusion
   b) Lamellar Laceration
   c) Superficial Foreign Body (FB)

2. *Open Globe:*
   a) Laceration
      - Penetrating
      - Perforating
      - Intraocular Foreign Body (IOFB)
   b) Rupture.

Superficial FB was removed using topical anaesthesia. For injuries requiring surgical repair, this was done with the patient under general anaesthesia (GA), using the operating microscope or surgical loupe in most cases. Corneal wounds were sutured with either 10/0 nylon or 8/0 virgin silk, depending on availability at the time of repair. Scleral wounds were sutured with 5/0 ethibond plus cryo-application at the site. Visco-elastic was used when necessary. Lens rupture apparent at the time of repair was treated with cortical washout (1 patient) or extracapsular cataract extraction (2 patients). Initial treatment of hyphaema included use of anti-glaucoma medication, sedative and mydriatic. Where conservative treatment of hyphaema was unsatisfactory, anterior chamber (AC) paracentesis was done under GA. All surgical patients received subconjunctival gentamicin and dexamethasone. Post-operatively, they received topical antibiotics, corticosteroid and mydriatic. Evisceration was performed in 7(6.4%) children because of severe infection and/or disorganised globe.

Visual acuity (VA), where possible, was tested using Snellen's chart, illiterate E chart or pictorial chart. Patients whose VA was not tested at last visit were excluded from the tables of final visual outcome. A good visual outcome was taken as a VA of 6/18 or better. Definitions of category of visual impairment and blindness by World Health Organization were used. Blindness was regarded as a vision of less than 3/60.

Twenty-eight children were lost after initial presentation. Only the 109 patients treated were included in the analysis of ocular survival. A saved globe was regarded as good ocular outcome. Phthisis and evisceration were taken as poor ocular outcome. The follow-up was 4 weeks or less in two-thirds of these patients and only 13% was seen more than 3 months after treatment.

RESULTS

The 137 children were 39.5% of the total 347 patients seen as emergency cases with ocular injury and they represented 13.4% of all paediatric attendance at the hospital during the period of review.

Age/Sex: As shown in Table 1, boys (91) outnumbered girls (46) with a 2 : 1 ratio, but in the ages 11–15 years the ratio was 4 : 1. The mean age was 7.73 years (range 5 months to 15 years). Sixty-six patients (48.2%) were within the age bracket 5–10 years, with a modal value of 16 at 10 years.

Table 1: **Age/Sex distribution of all the children reviewed with ocular trauma**

Age in years	Male		Female		Total	
	Freq.	%	Freq.	%	Freq.	%
< 1	–	–	1	(100)	1	(100)
1–4	18	(50)	18	(50)	36	(100)
5–10	46	(70)	20	(30)	66	(100)
11–15	27	(79)	7	(21)	34	(100)
Total	91	(66)	46	(34)	137	(100)

Residence: Nine-one patients (70%) came from Kaduna and its environs. The rest were from other states with a maximum radius of about 800 kilo-metres.

Time of Presentation and Prior Treatment: Most patients, 78(57%), presented 2–6 days following injury. Only 22% presented on the day of injury and 9(7%) came more than 2 weeks after injury. Ninety-three percent of those that presented on day of injury had no previous treatment, while for those presenting at 7–14 days, 35% had none. Patients that presented earlier were more likely to be without prior medication ($p < 0.005$).

Fifty-seven patients (41.6%) had received some form of medical treatment before presentation – 34 at a clinic/hospital, 4 at a specialist eye hospital, 9(6%) had self-medication; 79(57.7%) had none. Of those that had medication, a third had used topical antibiotics, 6% were on topical antibiotic/steroid preparations, 27% did not know the name of the drugs they used. None had used traditional eye medication (TEM).

Table 2: **Type of Ocular injury sustained**

Type		Freq.	%
Closed globe	Contusion	45	32.9
	Lamellar laceration	9	6.6
	Superficial FB	13	9.5
Open globe	Penetrating	53	38.7
	IOFB	1	0.7
	Rupture	7	5.1
Others	Eyelid injury	8	5.8
	Chemical injury	1	0.7
Total		137	100.0

Laterality: All the patients were injured in one eye only. Fifty-six (41%) and 81(59%) had right and left eye injury, respectively.

Type of Injury: Fifty-three (38.7%) had penetrating ocular injury, while 45(32.9%) had contusion injury. The various types of injury sustained are shown in Table 2.

Thirty-six patients (26.3%) had hyphaema of which there was associated hyphaema-induced glaucoma in 8 and traumatic cataract in 4. Thirteen of the patients (36%) required AC paracentesis.

Activity at time of injury: As shown in figure 1, sixty-seven (49%) of these children sustained ocular injury while at play, 34(25%) were involved in home accidents. Seven patients had industrial accidents; all were boys and mechanic apprentices. Six (4%) were involved in road traffic accidents (RTA).

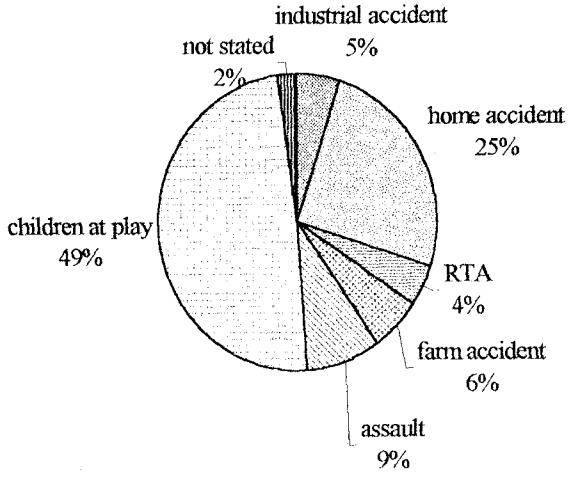

Fig. I: Activity at the time the injury was sustained

Table 3: **Visual acuity (VA) at Presentation and Last follow-up visit**

WHO Category	VA	At Presentation Injured Eye		At Last Visit Affected Eye		At Last Visit Better Eye	
		Freq.	%	Freq.	5	Freq.	%
Normal vision	≥ 6/18	20	(19)	15	(24)	56	(95)
Visual impairment VI	<6/18–6/60	12	(11)	4	(6)	1	(2)
Severe VI	<6/60–3/60	2	(2)	5	(8)	–	–
Blind	<3/60–PL	50	(48)	21	(33)	2	(3)
Blind	NPL	21	(20)	18	(29)	–	–
Total		105	(100)	63	(100)	59	(100)
Not stated		32		74		78	

Visual Acuity: As indicated in Table 3, of the 105 injured eyes tested, 71 eyes (67.6%) were blind by the WHO criteria, 20% were already NPL. Only 19% had normal vision. At presentation, 32(24%) of the injured eyes did not have their VA tested either because the patients were too young or uncooperative to have quantitative VA testing.

Seventy-four patients' final VA was not stated. Sixty-three patients' VA at last visit is shown. Thirty-nine injured eyes (62%) remained blind – 18(29%) were NPL.

However, when the better eye is considered, only 2 patients (3%) are regarded as blind and 95% had normal vision.

Past Medical/Ocular History: There had been no significant past ocular history or medical history in these children. Haemoglobin electrophoresis for patients with hyphaema was routinely done and none had sickle cell haemoglobinopathy.

Management Basis: Eighty patients (58.4%) were treated as in-patients, 29(21.2%) as outpatients, while 28(20.4%) were lost before treatment was commenced. For the lost cases, no reason was stated in 18, 8 had inadequate finances, one cited family logistics and one was referred because of multi-system pathology.

Seventy-six patients, 70% of those treated needed surgery. Most surgeries were done within 24 hours – 48 eyes (63.2%), but only 15(19.7%) were within 6 hours of presentation. Delay in surgery was accounted for by patient logistics (including unacceptability of the operation by the patient, e.g. evisceration) and inadequate finance in 21(34.5%), hospital logistics in 55.7% and initial conservative treatment for hyphaema and control of infection in 9.8%.

Length of Hospital Stay: Figure 2 shows that out of the 80 patients admitted, 65% stayed longer than 7 days and only 5(6.3%) stayed 3 days or less.

Follow-Up: The follow-up period was 4 weeks or less in 68% and >3 months in 13% of the 109 patients treated. Thirty-six percent were not seen since discharge.

Visual and Ocular Outcome: The ocular status as at the time they were last seen in shown in Table 4. Good final VA was related to good initial VA and non-penetrating injury. Poor final V was significantly related

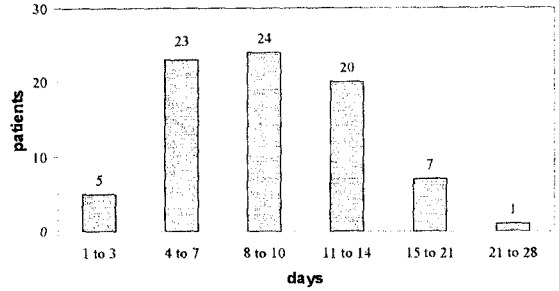

Fig. 2: **Length of hospital stay for the admitted patients.**

Table 4: **Ocular status at last visit**

Outcome	Freq.	%
Evisceration	7	6.4
Phthisical	12	11.0
Saved globe	86	78.9
Not Stated	4	3.7
Total	109	100.0

to poor initial VA ($p < 0.00005$), injury to multiple structures ($p<0.05$) and penetrating injury ($p<0.0005$).

Ocular survival, but not good final VA, was significantly related to early presentation ($p<0.0005$) and prompt surgery ($p<0.00005$).

Poor ocular outcome (evisceration and phthisis) was related to penetrating injury ($p < 0.0005$), injury to multiple ocular structures ($p < 0.5$) and evidence of infection at time of presentation.

DISCUSSION

The (epidemiological) pattern of eye injuries in children, accounting for 25–57% of all ocular traumas[6,8–11] remains largely the same, with a male preponderance ratio of at least 2:1[3,6,8,9,12] while most injuries were sustained while at play[6,9] and a quarter at home[6].

Twenty-two percent reported on the day of injury while 80% presented within a week, unlike nearly 3 decades ago when Olurin[6] noted that only 20% were seen within a week of injury. Though patients now seek medical treatment earlier, eye injuries in children remain a significant cause of ocular morbidity.

Some patients could not afford treatment and were lost while 58.4% had to be treated as inpatients, most of who stayed for admission for 8–10 days even though prompt surgical treatment was instituted where required. This is clearly a strain on the limited hospital and patient resources.

Generally, most ocular traumas are contusion injury[9]. In children, however, this study and a previous series[6] show a predominance of penetrating injury. This is a significant factor in predicting final visual outcome where penetrating injury contributes to poor visual outcome[11,12] and ocular survival. Poor visual/ocular outcome is also related to damage to multiple ocular structures and severity of initial injury[5,8,10,13]. In this review, eyes with poor initial VA, severe penetrating injuries, damage to multiple ocular structures, late presentation and delayed surgery were more likely to remain blind or be eviscerated.

Two-thirds of the eyes were blind (VA < 3/60) at presentation and most remained so at the time of review. Good final VA ≥ 6/18 was obtained in only 24%. Though this is low, it shows an improvement from that reported by Olurin[6] and Ajayi[8]. It is likely that post-op refractive error from corneal scar, astigmatic and aphakic anisometropia, amblyopia and posterior segment pathology also contribute to the poor visual outcome. Because follow-up period is short, other secondary effects of eye trauma such as traumatic cataract, retinal detachment, fibrous ingrowth and glaucoma could not be analysed; and secondary procedures such as penetrating keratoplasty, retinal detachment surgery and cataract surgery with IOL implantation had not been done in any of these children.

When vision in the better eye is considered, however, only 2 patients (3%) were blind by the WHO criteria. Ocular injury had been noted to be a major cause of monocular blindness[1,3,4] and a common cause of enucleation in children[14]. In earlier studies, evisceration was necessary in at least 40% of all ocular trauma cases[6,8]. Fortunately, this rate has declined, with only 6.4% requiring evisceration, comparing favourably with studies in other countries where the enucleation rate was 9.7%[10]. Evisceration, rather than enucleation, was undertaken in these cases because the eyes were infected and the scleral coat was retained to provide a protection from retro-ocular spread of infective organisms. Also, an improved understanding of ocular trauma has shown that sympathetic ophthalmitis is not so common[1,6,13]. The low rate of evisceration also reflects the reluctance of the surgeon to remove the eye of a developing orbit, restricting the procedure to severely disorganised eyes with poorly controlled infection and no visual potential.

Ophthalmic care for paediatric ocular trauma poses special needs in this environment because unilateral aphakia often remains uncorrected; there is limited technology to access posterior wounds and amblyopia may develop even after successful wound repair. Quantitative visual acuity testing is restricted to cooperative verbal or school children. As such, accurate data on visual outcome cannot be obtained. Also, children can be uncooperative for adequate examination, which may have to be done under GA at the time of surgery, with posterior examination made more difficult in the presence of anterior segment injury.

In conclusion, there is a need to encourage early presentation and shielding of injured eyes. Initial management at the hospital should be prompt and independent of the patients' financial constraint at the time of presentation. Further management should also emphasize refraction, treatment of amblyopia and search for and treatment of posterior segment pathology. Invariably, ocular injuries in children often result in severe visual deficit and the need for adult supervision of children at play and control measures[1,3,6,8,9,12–14] to prevent them cannot be, again, overemphasized especially as there is still limited technology for management of severe ocular injuries.

REFERENCES

1. World Health Organization. Prevention of childhood blindness. **In:** Causes of childhood blindness and current control measures, 1992; pp 21–22. WHO, Geneva.

2. Murdoch IE, Morris SS, Cousens SN. People and eyes: statistical approaches in ophthalmology. *Br. J. Ophthalmol.* 1998; **82(8):** 971–973.

3. Elebesunu M. Aetiology of childhood blindness in Benin City, Nigeria. Public Health, 1987; **101(1):** 59–62.

4. Nwosu SN. Blindness and visual impairment in Anambra State, Nigeria. *Trop. Geogr. Med.* 1994; **46(6):** 346–349.

5. Negrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiology, 1998; **5(3):** 143–169.

6. Olurin O. Eye injuries in Nigeria. *Am. J. Ophthalmol.* 1971; **72(1):** 159–166.

7. Kuhn F, Morris R, Witherspoon D, Heimann K, Jeffers

JB, Treister G. A standardised classification of ocular trauma. Ophthalmology. 1996; **103:** 240–243.

8. Ajayi BKG and Osuntokun O. Perforating eye injuries in Ibadan. *W. Afr. J. Med.* 1986; **5(3):** 223–228.

9. Ajaiyeoba AI. Ocular injuries in Ibadan. *Nig. J. Ophthalmol.* 1995; **3(2):** 23–25.

10. Elder MJ. Penetrating eye injuries in children of the West Bank and Gaza Strip, Eye 1993; **7:** 429–432.

11. Al-Salem M, Ismail L. Eye injuries among children in Kuwait: pattern and outcome. *Ann. Trop. Paediatr.* 1987; **7(4):** 274–277.

12. Cascairo MA, Mazow ML, Prager TC. Paediatric ocular trauma: a retrospective survey. *J. Paediatr. Ophthalmol Strabismus.* 1994; **31(5):** 312–317.

13. Wong TY, Seet MB, Ang. C. Eye injuries in twentieth century warfare: A historical perspective. *Surv. Ophthalmol,* 1997; **41(6):** 433–459.

14. Majekodunmi S. Causes of enucleation of the eye at Lagos University Teaching Hospital, a study of 101 eyes. *W. Afr. J. Med.* 1989; **8(4):** 288–291.