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Eye Injuries in Young Children: A Retrospective Study of Children Presenting to a Tertiary Hospital in Cape Town, South Africa

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Abstract

Background: There is paucity of data on the epidemiology of ocular trauma in children ≤13 years of age in South Africa. The aim of the study was to review the epidemiology of children with eye injuries presenting to a tertiary children's hospital in Cape Town, South Africa.

Methods: Socio-demographic data, diagnosis, and management information of all children who presented with ocular injury over a 5-year period (from January 2010 to December 2015) were extracted from the Trauma Unit registry and patient folders in the Ophthalmology clinic.

Results: A total of 186 cases were included in the study sample. After eliminating all cases with insufficient information, 144 cases were included, of which 96 (67%) were male and 48 (33.3%) were female. Most injuries occurred in and around the child's own home: inside 48 (36.4%), and 43 (32.6%) outside. Nineteen children were injured either at cheche or school (14.4%), 1 (0.8) on the pavement or road, 9 (6.8%) in a public space, 2 (1.5%) injuries occurred while playing sport, and 3 (2.3) were unknown. Most injuries occurred during summer, 55 (37.5%), followed by spring 36 (25%), autumn 32 (22.2%), and winter 32 (22.2%). The right eye was most frequently injured, in 73 cases (50.7%), the left eye was injured in 67 cases (46.5%), while bilateral injuries occurred in 4 cases (2.8%).

Conclusion: Most injuries occurred in and around the home, indicating the necessity for prevention programmes focused on safety within and around households, schools, and play areas.

Introduction

Ocular trauma is a significant cause of eye morbidity and the leading cause of non-congenital monocular blindness among children [1,2]. Globally it is estimated that 160,000 to 280,000 children under 15 years of age experience ocular trauma every year [3]. An estimated 2.2 billion people worldwide have a vision impairment, of which 1 billion could have been prevented [3-5]. The WHO analysis of unintentional eye injuries in children was 34.3 per 100 000, with population-based studies reporting eye injuries to be the third most common cause of emergency department admission. Studies conducted in the U.S. estimate one-third of the 387, 000 admissions to emergency departments to be paediatric cases [6], and a 10-year review conducted in the Chanshan region in China reported that 23.6% of eye injuries were children 0–14 years of age [7].

Children have an increased risk of ocular trauma because of their developing physical maturity, visual systems and coordination, and their inability to detect environmental risks [8]. Although approximately 90% of ocular trauma is preventable, injury can result in impaired visual function or blindness, often requiring ocular surgery [4,9,10]. In addition to ocular disability, eye injuries also have a substantive psychological and social impact on children as it affects neurodevelopment and communication. Vision is integral to the process of learning and communication, with approximately three-quarters of early childhood learning being acquired through vision [11].

Previous research has shown an ocular injury trend associated with age and gender. Where accidental blows and falls and car crashes caused most ocular trauma in very young children, sports

activities, burns and firearms were responsible for most eye injuries in older children. Boys were more likely to suffer from ocular trauma [10].

According to the Birmingham Eye Trauma Terminology System (BETTS), eye injuries can be classified into two different groups: open globe injuries (OGIs), defined as a full-thickness laceration of either cornea or sclera, and closed globe injuries (CGIs), described as partial-thickness corneal wounds [12]. Two types of CGIs are contusion (due to either direct energy delivery by the object or the changes in shape of the globe, no full-thickness wound) and a lamellar laceration (partial-thickness wound of the eyewall).

OGIs can also be divided into two different groups: laceration and rupture (full thickness wound of the eyewall caused by a blunt object). There are three types of lacerations: penetrating laceration (with only an entrance wound or the same entrance/exit wound), Intra Ocular Foreign Body (IOFB) and perforating laceration (with a separate entrance and exit wound) [12].

In South-Africa, recent data for accurately assessing the importance of ocular trauma in children in terms of frequency, distribution and impact on vision are not available, which validates the need for this research. This study provides epidemiological data on ocular injuries among children who presented to the Red Cross War Memorial Children's Hospital (RCWMCH), a government-funded public tertiary level hospital that serves children ≤13 years of age in the city of Cape Town in the Western Cape Province, South Africa.

Methods

This retrospective study of all children who presented with an eye injury to the Emergency Unit at Red Cross War Memorial Children's Hospital, a public paediatric tertiary facility in Cape Town, was conducted. Permission to conduct the study was obtained from the Health Science Faculty Research Ethics Committee at the University of Cape Town. The purpose of the study was to examine the epidemiology, cause and outcome of ocular injury in children presenting to the emergency unit over a 5-year period, from January 2010 to December 2015. Sociodemographic data, diagnosis, and management information were extracted from the Trauma Unit registry. Children with only minor ocular and periocular injuries were treated and discharged, while more serious cases were referred to the paediatric ophthalmology department for further assessment and care. Visual acuity was measured using the LogMAR scoring system for verbal children and using the categories of visual outcomes based on an ICOPH report on visual standards [13].

Age was categorized into four groups: infants (0-4 years of age), early childhood (5-9 years of age) and school going children (10-13 years of age). Data were entered into an Excel spreadsheet and analysed using STATA version 14.

Results

There was a total of 186 cases in the study sample. After eliminating all cases with insufficient information, the study included 144 participants of whom 96 (67%) were male and 48 (33.3%) were female. Children ranged in age from < 1 to 13 years of age, and 73 (50.7%) injuries affected the right eye, 67 injuries (46.5%) affected the left eye, and in 4 cases (2.8%) the injury involved both eyes. The largest proportion of injuries occurred inside the home 48 representing 36.4% of cases, with 43 (32.6%) occurring outside the home. Nineteen children were injured either at cheche or school (14.4%), 1 (0.8%) on the pavement or road, 9 (6.8%) in a public space, 2 (1.5%) injuries occurred while playing sport, and 3 (2.3%) were unknown.

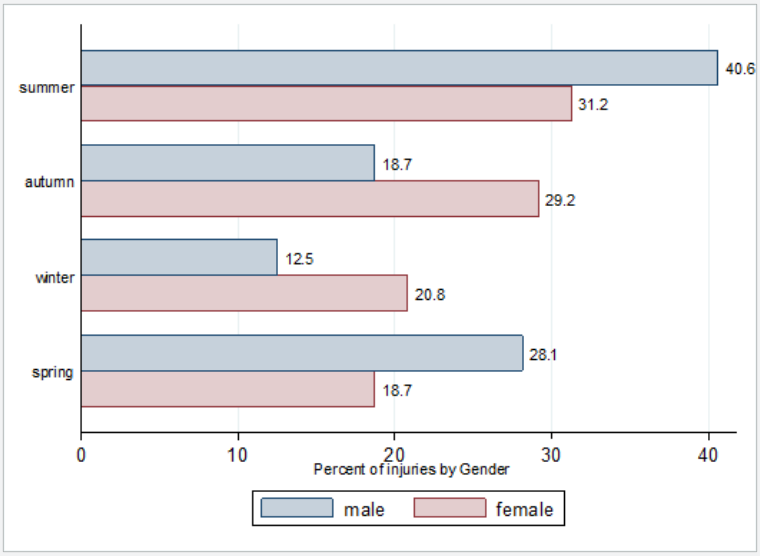

Figure 1: Seasonal change in the proportion of injuries among males and females.

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Males were twice as likely as girls o present with an eye injury, with 45 (46.9%) of injuries occurring in boys aged 5 to 9 years, compared to 21 (43.8%) in girls of the same age group. In the 0 to 4-year age group 33 (34.4%) boys sustained eye injuries compared to 18 (37.5%) of girls. Approximately one-fifth of eye injuries occurred children in the 10-13-year age group, 18 (18.8%) in boys and 9 (18.8%) in girls (Table 1 & 2, Figure 1).

Table 1: Descriptive table of 144 children with eye injuries for boys and girls. Presented as n (%) unless specified

	Total	Male	Female
Number of children	144	96	48
Median age in years (IQR)	6 (3-9)	6 (3.5-9)	7 (3-8)
Age group			
0-4	55 (36.2)	33 (34.4)	18 (37.5)
9-May	68 (44.7)	45 (46.9)	21 (43.8)
13-Oct	29 (19.1)	18 (18.8)	9 (18.8)
Affected eyes			
Right eye	73 (50.7)	52 (54.2)	21 (43.8)
Left eye	67 (46.5)	42 (43.8)	25 (52.1)
Both eyes	4 (2.8)	2 (2.1)	2 (4.2)
Place if injury occurrence			
Own home inside	48 (36.4)	24 (25.0)	24 (50.0)
Own home outside	43 (32.6)	34 (35.4)	9 (18.8)
Creche/School	19 (14.4)	17 (17.7)	2 (4.0)
Pavement/road	1 (0.8)	1 (1.0)	0
Public space	9 (6.8)	7 (7.3)	2 (4.2)
Sport	1 (1.0)	1 (2.1)	2 (1.4)
Other	2 (1.5)	1 (1.0)	1 (2.1)
Unknown	1 (0.8)	0	1 (2.1)
Missing data	7 (7.3)	5 (10.4)	12 (8.3)
Season of injury			
Summer (Dec-Feb)	55 (37.5)	39 (40.6)	15 (31.3)
Autumn (Mar-May)	32 (22.2)	18 (18.8)	14 (29.2)
Winter (Jun-Aug)	22 (15.3)	12 (12.5)	10 (20.8)
Spring (Sep-Nov)	36 (25.0)	27 (28.1)	9 (18.8)

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Table 2: Place of injury by age group.

	Age group		
Place if injury occurrence	**0-4 years**	**5-9 years**	**10-13 years**
Own home inside	29 (56.9)	15 (22.7)	4 (14.8)
Own home outside	12 (23.5)	22 (33.3)	9 (33.3)
Creche/School	1 (2.0)	12 (18.2)	6 (22.2)
Pavement/road	0	0	1 (3.7)
Public space	1 (2.0)	7 (10.6)	1 (3.7)
Sport	0	1 (1.5)	1 (3.7)
Other	1 (2.0)	1 (1.5)	0
Unknown	0	0	1 (3.7)
Missing	4 (7.8)	5 (7.6)	3 (11.1)

Visual acuity

There were 71 children in whom visual acuity was assessed, on initial presentation as well as after full treatment (outcome). Twenty-one (30%) had no change in visual acuity, four (6%) had worse outcome visual acuity, while 46 (65%) had improved outcome acuity (Table 3).

Table 3: Initial and outcome acuities among 71 children with both acuities recorded.

		Outcome visual acuity								
		Verbal						Pre-verbal		
		Normal	**Mild**	**Moderate**	**Severe**	**Near blindness**	**Blindness**	**100s & 1000s**	**Fixes & follows**	**Poor fixation**
Initial visual acuity	**Normal**	12	0	0	0	0	0	0	0	0
	Mild	9	6	0	0	1	0	0	0	0
	Moderate	3	0	2	0	0	1	0	0	0
	Severe	2	1	0	0	0	0	0	0	0
	Near blindness	6	6	3	1	9	0	0	0	0
	Blindness	0	0	0	0	0	3	0	0	0
	Fixes & follows	2	0	0	0	0	0	1	1	0
	Poor fixation	0	1	0	0	0	0	0	0	1

Of these 71 children, 68 were able to express their acuity verbally. Of these, 34 children had a normal acuity as outcome; 14 had mildly diminished acuity; 5 moderate diminished acuity; 1 severely diminished acuity; 10 had near blindness and 4 were completely blind. From the 3 pre-verbal children in this group, 1 child seemed normal, 1 fixed and followed, while 1 child had poor fixation.

Discussion

This study highlights the diversity of eye injuries in 144 children ranging from 0 to 13 years of age who presented at a tertiary children's hospital in Cape Town. Children aged 5-9 years represented 68 (44 %) of all eye injuries, 55 (36.2%) injuries occurred in children 4 years and younger, and 29 (19.1%) injuries occurred in children 10-13 years of age. Similar to studies conducted in Finland [14], Lithuania [15], the U.S [16], and the Philippines [17] most injuries were domestic, with 36.4% sustained inside the home and 32.6% outside the home.

Among the 55 children 4 years and younger, 29 (56.9%) injuries occurred inside the home, suggesting the need for information about preventing injuries in the home related to common objects like toys and utensils [18] as well as the importance of supervised play [5].

Differing from our results is a study conducted in Ethiopia in which 37% (126) injuries occurred in children 11-15 years of age [11], and 14.4% of injuries occurred at creche or school.

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Sports-related injuries were rare in this study, 1 occurred in the 5-9-year age group and 1 in the 10–13-year group.

Consistent with studies conducted in the United States [19,20], hospital visits for eye injuries were more frequent during summer (December-February) 55 (37.5%) and spring 36 (25.0%), compared to 22 (15.3%) in winter (June -August).

Similar to the study conducted by Abbott and Shah [10] eye injuries were more common in boys 96 (66.7%) compared to girls 48 (33.3%), with the male to female ratio being 2:1. An earlier South African study reported the male to female ratio for eye injury to be 2.3:1 [21]. The male to female ratio in a study conducted in Nepal was 3.5:1, comparable to a study of corneal laceration injuries in children in Nigeria in which the ratio was 3:1 [22], suggesting increased physical contact and tendency toward robust play among boys as a risk factor [19].

Most eye injuries were unilateral, with right eye involvement being higher 73 (50.7%) than left eye involvement 67 (46.5), similar to right eye predominance found in study in Nepal 54.33% [23]. This differs from the findings of the study in Finland in which 105 (52%) injuries involved the left eye, 93 (46%) affected the right eye and 4 (2%) were bilateral [14].

Consistent with the retrospective cohort study of 53 569 176 paediatric cases in the NEDS data, we observed that the risk of vision loss was low [6]. In this study only 4 (2.8%) were bilateral eye injuries, with severe visual outcome in a small proportion compared to 18.4% of trauma resulting in severe visual impairment (VA≤0.1) in the study conducted in Lithuania [15].

An interesting finding in this study was the absence of injuries associated with pellet guns, described in a study in Finland, which caused 6% of eye injuries, with 36% resulting permanent visual impairment [19]. There were no reported firework-related injuries as experienced during the Diwali festival in Southern India [24], and penetrating sport injuries found in a study conducted in London, UK [25].

Conclusion

This study quantified the burden of ocular trauma in a tertiary paediatric hospital in Cape Town of children ≤13 years of age.

Most injuries occurred in and around the home, in particular in the age group of 0-4 years, indicating the for need injury prevention awareness and improving household safety measures.

Of the 71 children who had their acuity assessed on arrival as well as after treatment, nearly half had impaired acuity, with the injury causing complete blindness in 5 (7%) cases; indicating the severity and permanent sequelae of these injuries.

This research highlights the need for collaboration between ChildSafe South Africa with relevant child safety networks around public awareness campaigns for improving child vision safety at home and school.

Acknowledgement

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Limitations

The main limitation of this study is that it was based on a retrospective record review. Substantial difficulties were experienced in tracing the necessary ophthalmological records. Clinical notes were not uniform and ICD-10 codes were often not recorded; hence it was not always possible to assess the extent to which clinical care conformed to standard clinical guidelines.

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