

Pediatric Ocular Trauma From A Tertiary Public Hospital in Colombia: Epidemiological Characterization

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Abstract

Background

Eye injury is a serious public health problem being in the world, that causes unilateral blindness, a particular condition in children due to the functional impact and psychosocial implications. The eye injury can be prevented thanks to the identification of risk factors associated with the socio-cultural context, this aspect has motivated studies in the pediatric population in United States, India, Australia, Cuba, Egypt, United Kingdom, Brazil, Colombia, Marathwada and Canada, among others. So the objective of the present study is to describe the sociodemographic and epidemiological characteristics of pediatric eye injury and its effects on ocular structures in a tertiary public hospital from Colombia.

Method

A retrospective cross-sectional study was carried out between January 1, 2015, and December 31, 2017, in a tertiary public hospital of a medium-sized city located in the Northeast of Colombia. Children under 15 years old with trauma to the eyeball or its adnexa were included. The Birmingham Eye Trauma Terminology System (BETTS) was used. Eye burns and Ocular adnexa were also included.

Results

61 cases of eye injuries were recorded, 67.21% (41 cases) of which were males. 57.37% (35 of the cases) corresponded to closed-globe injuries both contusion and lamellar laceration. Visual acuity fluctuated between 20/20 and 20/40. 14.75% (9 cases) were Open-globe injuries while 50% (4 cases) were penetrating trauma. 27.86% of the injuries (17 cases) did not directly compromise the eyeball, 58.82% (10 of these cases) of which corresponded to eyelid wounds, and neither of those had the visual acuity information

Conclusion

The study showed that the majority of eye traumas are closed globe, caused by

Introduction

Eye trauma or eye injury (EI), as indexed by the Medical Subject Headings (MeSH), is considered a serious public health problem involving psychosocial implications and can be prevented in 90% of cases [1, 2, 3]. Globally, 1.6 million people develop blindness as reported by Negrel et al in 1998 [4]. Every year, serious ocular trauma affects a quarter of a million children [5]. According to Scruggs et al, in the United States between 2003 and 2007, EI was considered the main cause of unilateral blindness affecting 40,000 to 60,000 patients annually [6].

For the year 2000, 2.4 million eye injuries were estimated per year; 35% of which occurred in people 17 years of age or younger according to Brophy et al [7]. Most of the childhood EI occur in recreational environments and are caused by physical mechanisms such as toys or artifacts that can be easily manipulated by children. Adult traumas, however, usually occur due to occupational accidents [8, 9, 10, 11].

Using extrapolated data from the global population, it is estimated that between 160.000 and 280.000 children under 15 suffer severe EI every year and most require hospitalization [5]. Studies show that males are affected more than females with a ratio ranging from 2: 1 to 4: 1. [12, 13] For a study carried out in Santander, Colombia in

2003, the highest percentage of children with ocular trauma was between 0 and 5 years [14]. Blunt and sharp objects were reported as the most common trauma mechanisms. Children were usually alone when the trauma occurred [5].

Given the characteristics and implications of EI, different classification systems have been created to standardize diagnoses of professionals worldwide. The one used in this study is the Birmingham Eye Trauma Terminology System (BETTS) which classifies trauma according to injuries to the eyeball walls. These include closed-globe injury (CGI), all those where there is a partial thickness wound, and open globe injury (OGI) in which there is a full-thickness wound on the walls of the globe [15].

In Colombia, few reports are available in this regard, except for a study carried out in a hospital in northeastern in 2003, therefore, this research pretend describe the sociodemographic and epidemiological characteristics of pediatric eye injury in the only public hospital in Bucaramanga, Colombia.

This characterization contributes to explore the medical care in a tertiary public hospital and help to know the potential risk factor associated with pediatric eye injury in a medium-sized city in the Latin America Country.

Methodology

A retrospective cross-sectional study was carried out between January 1, 2015 and December 31, 2017 with the participation of the University Hospital of Santander (HUS by its acronym in Spanish), which facilitated the collection of information.

Eligibility Criteria

Children under 15 years old with trauma to the eyeball or its adnexa were included. The clinical reports that had little clinical correlation of data or erroneous diagnoses within the area were excluded.

Setting and sample

Through a non-probabilistic sampling for convenience. The eye injuries presenting over three years to the Ophthalmology Services of the University Hospital of Santander, who met the selection criteria were included.

Clinical evaluation

Initially, patients were evaluated in the emergency room of the HUS, and in case of alterations that affected the eyes, they were referred to the Ophthalmology Unit where they were evaluated by optometrists and ophthalmologists.

Demographic information, date of injury (cause, mechanism, type, clinical signs) and visual outcome were recorded for medical charts of all patients. The ocular examination was carried out with direct ophthalmoscope, slit lamp and to explore the fundus was used the indirect ophthalmoscope in case of clear ocular media with +20 Diopter lens. Visual acuity was measured using the Landolt C chart and Snellen's charts. For preschool children, the visual acuity was evaluated with the fixation.

The information available in the medical record was reorganized according to Birmingham Eye Trauma Terminology, two more categories were included (Eye burns and Ocular adnexa injuries).

Statistical analysis

A univariate descriptive analysis was carried out applying the relevant statistical tests according to the nature and scale of measurement of the variables. Measures of central tendency and dispersion were considered in the case of quantitative variables, while for qualitative variables, the calculation of proportions was considered.

The normality of the continuous data was tested, and the median was used with the interquartile range (IQR) when a non-normal distribution was presented.

Additionally, bivariate analysis was performed to establish the association between sociodemographic variables (age, sex, education, affiliation to the health system, place of residence) and clinical characteristics such as the type of trauma and its corresponding mechanisms using the Fisher's Exact Test.

The analysis was done in the software Stata 14.

Ethical considerations

This paper follows the foundations outlined in the Declaration of Helsinki.

The Ethics Committees in scientific research of the Universidad Industrial de Santander (Colombia) waive the requirement for informed consent to develop the study because the investigation achieves with the following points:

1. The study involves minimal to no risk to subjects because the only known risk to patients is the possible loss of confidentiality, which has been guarded against by limited access personnel to the database and password protection as well.
2. The waiver will not adversely affect the rights and welfare of the subjects because this study is non-interventional and does not affect the subject's rights for patient care and does not interfere with the welfare. Subject confidentiality will be protected by the assignment of a code for the identification in the study.
3. The research could not practicably be carried out without the waiver because much time has elapsed since these subjects were last seen locally and the pediatric ocular trauma is a rare event, for that reason the study had to be carried out retrospectively.
4. This study is non-interventional and thus providing information to patients is not likely. Also, they are reviewing medical records but are not recording identifiers. They would not be able to link subjects back to the study and therefore would not be able to provide additional information.

Information from the medical records was extracted by two senior Optometry students using a collection format designed for the study.

Results

61 pediatric patients admitted to the University Hospital of Santander from January 1, 2015 to December 31, 2017 were included. Four records were excluded during the selection process to evince incomplete medical charts. During the period of evaluation, 34.43% (21) of the injuries were registered in March, September and October and the children with 11 years old had the highest frequency of trauma 11.47% (7) (See Fig. 1)

67.21% (41 cases) were male 81.91% (50 cases) resided in urban areas and the median age was 9 years (0.91-15). 93.44% of the participants (57 cases) were affiliated with the subsidized health regime. 67.21% (41 cases) were in

school and 85.25% (52 cases) came from the department (administrative district in Colombia) of Santander. There were no statistically significant differences by sex in those variables (See Table 1).

The highest prevalence found corresponded to mixed EI (75.41% (46 cases)) considered as injuries that affect more than one ocular structure at the same time. Of the total of 61 patients, 35 involved closed-globe injuries, 9 were OGI and 17 were without globe involvement (see Fig. 2).

There was a higher prevalence of closed lamellar laceration trauma with 53.85% (7 cases) presenting visual acuity between 20/20 and 20/40, followed by 50% (4 cases) for penetrating OGI. No statistically significant relationships were evidenced (See Table 2)

When analyzing the place where EI occurs, the highest proportion occurred in the street with 32.79% (20 participants) followed by 26.23% (16 cases) which occurred at home. (See Table 3).

Likewise, 45.71% (16) of closed-globe injuries, the most frequent of which were contusions, occurred in minors between 6 to 10 years of age (56.25% = 9 children). While opening globe injuries 55.56% (9) corresponding to penetrating injuries, also occurred in minors between 6 to 10 years of age. Fractures and eyelid injuries without globe involvement 47.06% (8) registering the same frequency, occurred in children under 5 years five years of age. No statistically significant differences are evidenced when analyzing types of trauma by age group. (See Table 3).

Evaluation of ocular structures: the conjunctival hyperemia 47.54% (29 cases) were found the most prevalent clinical characteristics, followed by 26.23% (16 cases) eyelid edema and corneal laceration 11.47% (7 cases), additionally the children present in a few proportions (less than 5%) non-reactive pupil, hyphema, scleral erythema, palpebral ecchymosis, among others signs. 70.49% of the total population (43 cases) required hospitalization and medication for blunt-type eye trauma that occurred in 62.86% (12 of the cases). Pharmacological management was used in 86.36% (19 cases).

Lamellar lacerations, 37.14% (13 cases), 76.92% (10 cases) required medication management. There was no statistically significant association between the form of management and the type of trauma.

63.93% (39) of injuries were generated by blows, this being the most frequent EI mechanism in all age groups. Followed by foreign body injuries, which represented 19.67% (12) and were the second most frequent caused in children between 6 to 15 years old (See Fig. 3).

Discussion

Eye injuries are one of the major causes of morbidity and blindness in the pediatric population [16, 17, 18]. In Colombia, little data is available in this regard, except for a study carried out by Serrano et al in the period from January 1, 1996 to December 31, 2000 [14] and 7 cases reported by Tello et al in another hospital, in the same city between 2013 and 2018. The same team carried out another study in 2014–2015 but in an adult population.

In the present study, 61 childhood EI were recorded. The highest percentage 67.21% (41 cases) were male, which is consistent with worldwide studies [19, 20, 21]. There was a predominance of OGI in 57.37% (35 of the cases) as was the case in the study by Serrano et al in which a prevalence of 82.89% was obtained. In contrast, injuries to the ocular adnexa and the orbit presented a prevalence of 27.86% (17 cases) of childhood EI. This finding is also

recorded in the study of Gise et al in the United States with a prevalence of 39.1% of lesions in ocular adnexa and 35.8% of orbital traumas in the period 2008–2014 [22].

The greatest number of injuries occurred in the 6 to 10-year-old group with 39.34% (24 of the cases), followed by the 11 to 15-year-old group – 36.06% (22 cases). These data are similar to those reported by Prakash et al in India for 2017, where a higher percentage of trauma was found in children between 11 and 15 years of age [23]. The above is also related to data recorded by Huda et al in the 2005–2009 period. In this study, there was a higher prevalence in the 6 to 14-year-old group [24]. In Kadappu et al in Australia, there was a higher proportion of trauma among the 9 to 14-year-olds for the period 2000–2008 [25].

Regarding EI mechanisms, blows to the eyes represented 86.67% of the cases, with 19.67% being the result of falls. This differs from several studies such as that of Ricardo Marti et al in Cuba, who show the prevalence of blows by spinning tops in 24.3% of the population in 2015 [26]. Ebrahim et al in Egypt report that 20% were due to trauma caused by broomsticks for the year 2016 [18], and Singh et al in India show that by 2017, 29.54% of the injuries were caused by organic objects such as tree branches and sticks [27]. In contrast, in the United Kingdom, according to Abbott et al, childhood EI was caused by compressed air guns in 53% of the cases [5]. This implies that the mechanisms are related to the presence of objects that are within the reach of children for their recreational activities.

In the matter of the place of occurrence, 32.79% (20 cases) happened outdoors. This data contradicts those reported by Serrano, where the home was found to be the place of greatest occurrence with 44.4% of the cases [14], as was also the case in the study by Huda et al with 42.5% occurring at home [24].

Concerning visual acuity, a value between 20/20 and 20/40 was recorded for lamellar laceration CGI. This VA data was also recorded by Archambault et al in Canada between 2007 and 2010 [29] for contusion-type CGI and by Serrano et al in Northeast Colombia [14] with a minimal difference in the VA range between 20/20 and 20/50.

Finally, during the development of the present study, flaws were identified in the registry of visual acuity in 42.62% of the clinical histories and non-standardization in the description of the alterations by structure. In the same way, according to the characteristics of the study population the inference of the results could be limited to children under 15 years old, residents in the urban place, schooled, with subsidized affiliation to the health system, that go to the medical care at the public hospital.

Conclusions And Recommendations

The study showed that childhood eye traumas in the Northeast Colombian region, are more frequent in males. By age group, it presents a higher percentage of blunt globe injuries between 6 and 10-year-old children. Regarding ocular structures, injury is recorded in one or more of them, being classified as a mixed commitment.

Considering that falls represented a frequent mechanism of pediatric EI, it could be inferred that having permanent supervision of parents or responsible adults in daily activities and entertainment would help reduce the number of cases.

In the study, we found alterations in the structures of the orbit, eyelids, eyebrows, and lacrimal apparatus. Taking into account, the BETT classification only considers open and closed EI, the need to include an additional category, corresponding to without globe involvement, was evidenced.

In the medical record is important get the report of the visual acuity and the standardization terms for semiological description with the purpose of streamlining the evolution of the patients and to facilitate the investigation process.

Declarations

Ethics approval: Approval for the study was obtained from the Ethics Committees in scientific research of the Universidad Industrial de Santander accord number 029 December the 15th 2017.

Consent for publication: the manuscript has been read and approved by all named authors

Availability of data and materials: Due to the nature of this research, the hospital that allowed access to information did not agree for their data to be shared publicly, so supporting data are only available in the case of special requirement by contact diana.palencia@ustabuca.edu.co

Competing interests: The authors declare no conflict of interests

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Tables

Table 1
Distribution of sociodemographic characteristics by sex

SOCIODEMOGRAPHIC	TOTAL	MALES	FEMALES	P VALUE
CHARACTERISTICS%(n)		n = 41	n = 20	
AGE (years)	9 (6) ^a	7 (7)	9.41 (5.46) ^a	
AFFILIATION TO THE HEALTH SYSTEM				0.5 ^b
Contributive	1.64 (1)	2.44 (1)	0 (0)	
Subsidized	93.44 (57)	95.12 (39)	90 (18)	
Personal medical payments	4.92 (3)	2.44 (1)	10 (2)	
SCHOOL				0.5 ^b
Yes	67.21 (41)	63.41 (26)	75 (15)	
No	13.11 (8)	17.07 (7)	5 (1)	
Non-report	19.67 (12)	19.51 (8)	20 (4)	
PLACE OF RESIDENCE				0.09 ^b
Urban	81.97 (50)	87.8 (36)	70 (14)	
Rural	18.03 (11)	12.2 (5)	30 (6)	
DEPARTMENT ^c				0.56 ^b
Arauca	3.28 (2)	4.88 (2)	0 (0)	
Bolívar	6.56 (4)	7.32 (3)	5 (1)	
Cesar	1.64 (1)	0 (0)	5 (1)	
Norte of Santander	3.28 (2)	4.88 (2)	0 (0)	
Santander	85.25 (52)	82.93 (34)	90 (18)	
a. Median Interquartile Range b. P-value obtained with Fisher's Exact Test c.				

Table 2
Initial visual acuity by type of trauma

Visual acuity	Closed globe		p ^b value	Open globe		p ^b value	Without globe		p ^b value
	Contusion	Lamellar laceration		Rupture	Penetrating		Fracture	Eyelid	
20/20 –	45.45 (10)	53.85 (7)	0.24	0(0)	50 (4)	0.55	14,29 (1)	30 (3)	0.56
20/40									
20/50 –	13.64 (3)	7.69 (1)		0 (0)	12.50 (1)		14,29 (1)	0 (0)	
20/100									
20/200 –	0 (0)	15.38 (2)		0 (0)	25 (2)		0 (0)	0 (0)	
LP ^a									
Non-report	40.91 (9)	23.08 (3)		100 (1)	12.50 (1)		71.43 (5)	70 (7)	
a.	Light perception b. P value obtained by Fisher's exact test								

Table 3
Distribution of the types of trauma and place of occurrence by age

	0.91-5 years	6-10 years	11-15 years	P Value ^a
	n = 20	n = 21	n = 20	
Type of trauma %(n) Closed Globe (n = 35)				
Contusion	22.73 (5)	40.91 (9)	36.36 (8)	0.73
Lamellar laceration	15.38(2)	53.85 (7)	30.77 (4)	
Open Globe (n = 9)				0.44
Rupture	0 (0)	0 (0)	100 (1)	
Penetrating	0 (0)	62.5 (5)	37.5 (3)	
Without involvement (n = 17)				0.83
Fracture	57.14 (4)	14.29 (1)	28.57 (2)	
Eyelid	40 (4)	20 (2)	40 (4)	
Place % (n)	40.0 (6)	20.33 (5)	22.73 (5)	0.17
Home	0 (0)	0 (0)	9.09 (2)	
School	20 (3)	29.17 (7)	45.45(10)	
Street	6.67 (1)	29.17 (7)	13.64 (3)	
Others	33.33 (5)	20.83 (5)	9.09 (2)	
Non-refer				
a. P value obtained by Fisher's exact test				

Figures

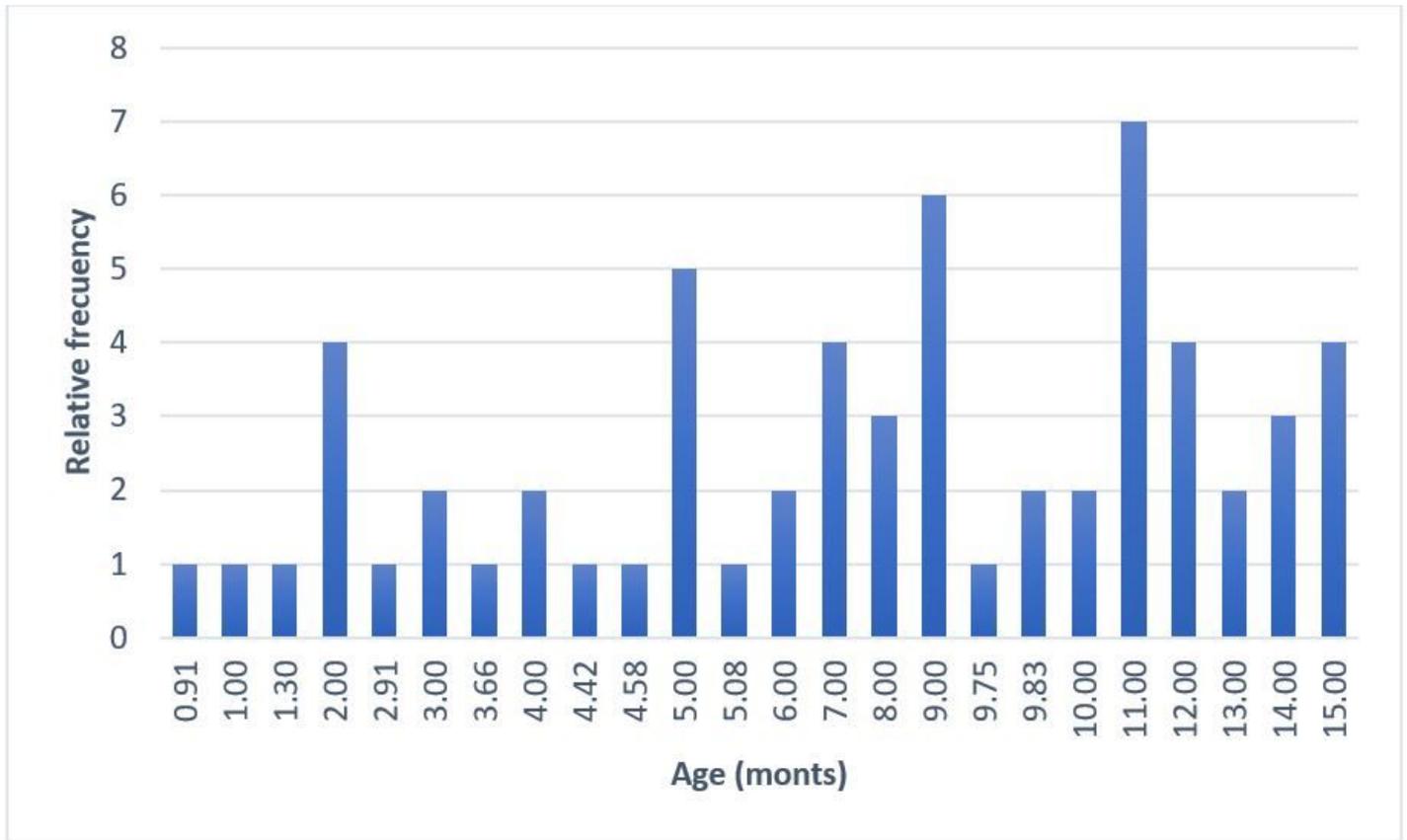
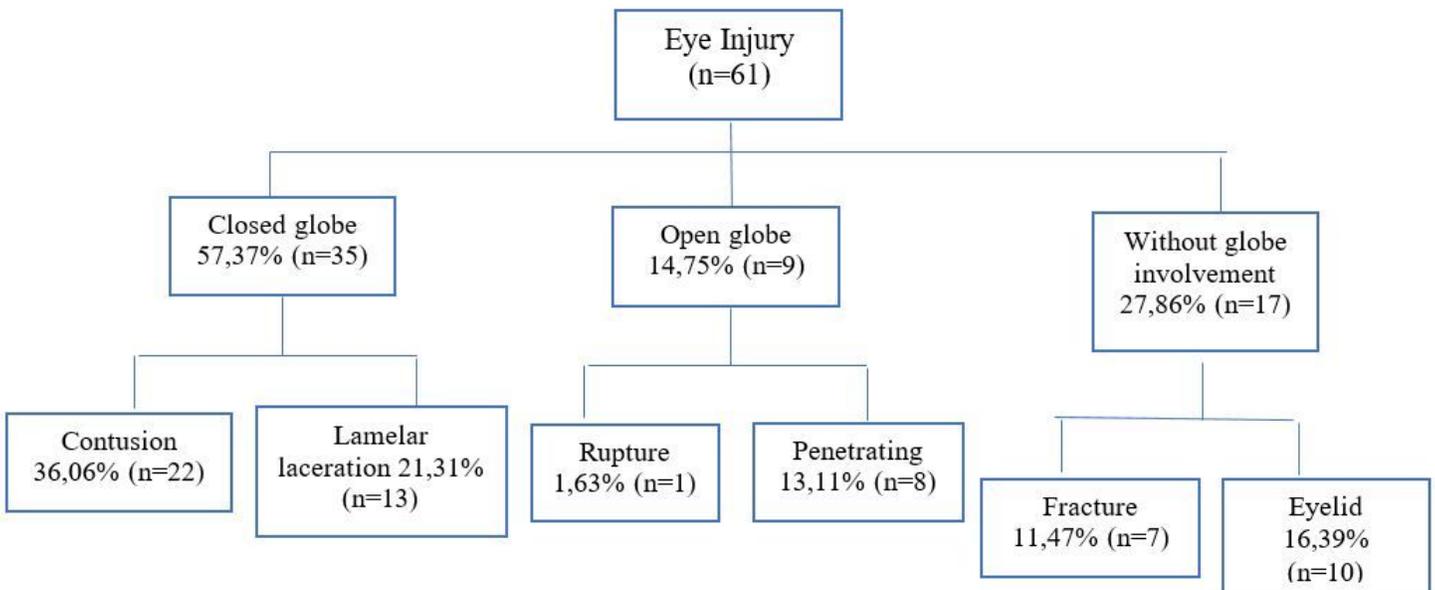


Figure 1

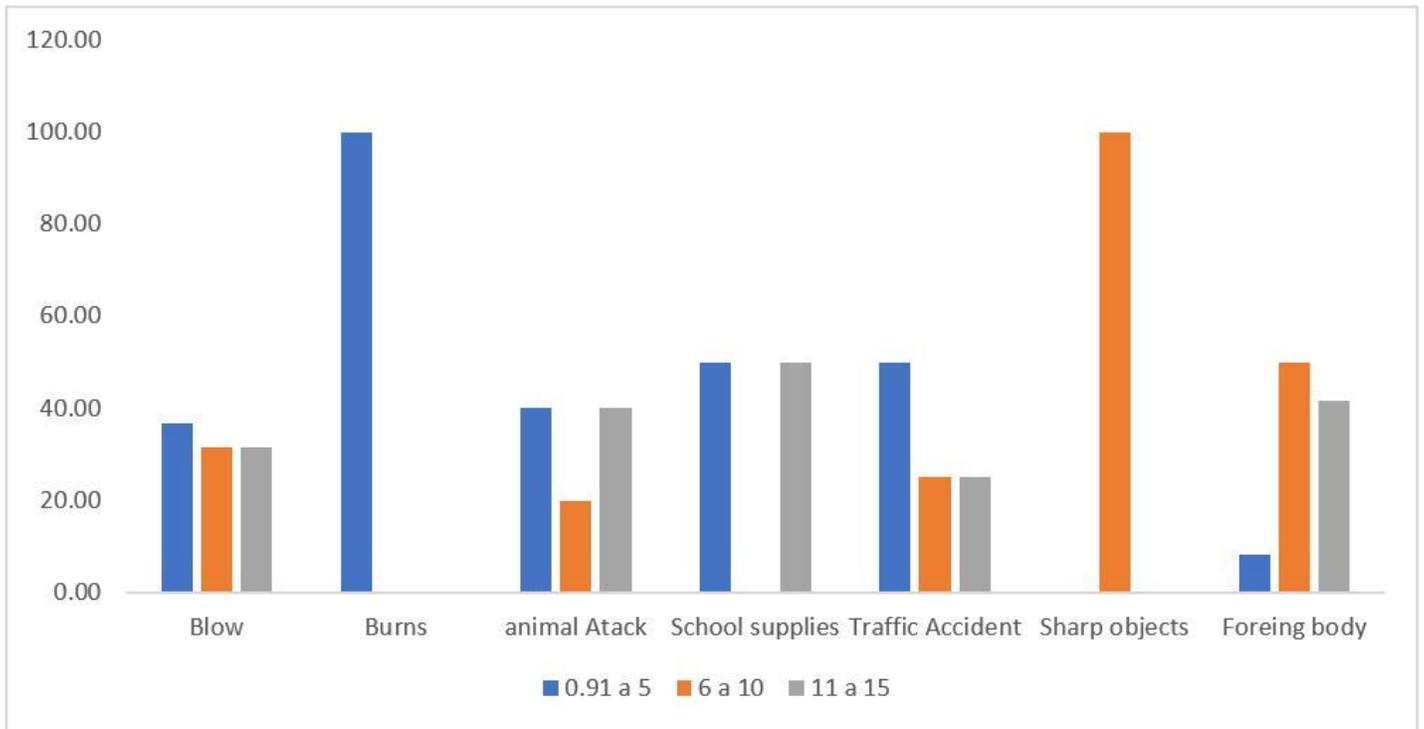
Distribution of eye injury by age



Source: The authors

Figure 2

Distribution of the types of trauma according to the BETT Classification



Source: The authors

Figure 3

Distribution of the trauma mechanism by age group