

Pediatric traumatic cataract review: origin of the trauma

Catarata traumática pediátrica: origem do trauma

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ABSTRACT

Objective: To identify the main causes of traumatic cataracts in childhood, based on a scientific review. **Methods:** Review in Lilacs, Pubmed, Cochrane, Bireme and Sciencedirect databases for the keywords: infant cataract, traumatic cataract, child, pediatrics, low vision, blindness, cause, incidence, ocular trauma. **Results:** Seventy-two (72) articles on traumatic cataract were found. From these, 17 presented tables relating the cause of ocular trauma to the formation of cataract in pediatrics. This article presents the main findings and analysis of the topic in the literature. **Conclusion:** The traumas etiologies which were most prominent in the studies analyzed were pointed objects such as cuttings, splinters and wood stick. Boys were more affected and there was a relation with practice of internal and external activities of domicile, in rural and urban zones.

Keywords: Cataract/etiology; Eye injuries; Low vision; Blindness; Child

RESUMO

Objetivo: Identificar as principais causas das cataratas traumáticas na infância, baseado numa revisão científica. **Métodos:** Pesquisa nas bases de dados Lilacs, Pubmed, Cochrane, Bireme e Sciencedirect com as palavras-chave: catarata infantil, catarata traumática, criança, pediatria, baixa visão, cegueira, causa, incidência, trauma ocular. **Resultados:** Foram encontrados setenta e dois (72) artigos sobre catarata traumática. Destes, 17 apresentaram tabelas relacionando a causa do trauma ocular com a formação de catarata em pediatria. Este artigo apresenta os principais achados e análise do tema na literatura. **Conclusão:** As etiologias dos traumas que apresentaram maior destaque nos estudos analisados foram com objetos pontiagudos como estaca, lascas e graveto de madeira. Meninos foram mais acometidos e houve relação com prática de atividades internas e externas ao domicílio, em zona rural e urbana.

Descritores: Catarata/etiologia; Traumatismos oculares; Baixa visão; Cegueira; Criança

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INTRODUCTION

Pediatric cataract is an important cause of low vision and blindness in childhood. It may be associated with congenital ocular malformations, intrauterine infections, genetic syndromes, systemic alterations, inborn errors of metabolism, heredity, use of medications, radiation, idiopathic or caused by ocular trauma.⁽¹⁻⁵⁾ The traumatic cause is observed as the second of major importance.⁽⁶⁾

Traumatic cataract is defined as a permanent opacification of the lens resulting from blunt or penetrating trauma to the eye. It can occur concomitantly with other changes in anterior and posterior segment or appear as an isolated alteration a long time after the ocular trauma.^(7,8) Cataract, dislocation or subluxation of the lens after the trauma are markers of ophthalmologic severity.⁽⁸⁾

According to the World Health Organization, the prevalence of childhood blindness is variable and is related to the socioeconomic development conditions and infant mortality rates of the countries.⁽⁹⁾ Ocular trauma is the leading cause of unilateral blindness in pediatric patients.⁽¹⁰⁾ It is estimated that trauma prevention is possible in up to 90% of cases,^(11,12) avoiding the mechanisms of injuries which cause damage to the ocular structures.⁽¹³⁾

The incidence rate of ocular trauma ranges from 0.746 to 9.9 per 10,000 children in the United States and other developed countries.⁽¹⁴⁾ In these countries, the estimated frequency of traumatic cataract in pediatrics is 30% of all cataracts in childhood and adolescence, and in the age group between 6 and 15 years it reaches 41%⁽¹⁵⁾ and is a significant cause of visual deficiency,⁽⁵⁾ with social, emotional and psychological consequences to the child.⁽¹²⁾

However, epidemiological studies on ocular trauma in childhood have varied results according to the geography, demographic, social and cultural factors of the population.^(9,12,13)

METHODS

This review sought to identify etiologies and to quantify the different types and mechanisms of ocular trauma related to the development of pediatric cataract. The references were obtained from the Lilacs, Pubmed, Cochrane, Bireme and Scencedirect databases. Keywords in Portuguese and English were used: infant cataract, traumatic cataract, child, pediatrics, low vision, blindness, cause, incidence, ocular trauma. 72 articles on this topic were found.

From these, 17 articles presented tables relating the cause of ocular trauma to the formation of pediatric cataract, which were used for the present study. The age intervals of the articles were variable; some authors considered the age group between 0 and incomplete 18 years of age; others used the age group between zero and 12 years of age. These ages are within the pediatric spectrum.⁽¹⁶⁻¹⁸⁾

RESULTS

The origin of ocular trauma related to the formation of pediatric cataract can be seen in table 1.

DISCUSSION

Sharp objects were present in most of the articles evaluated as well as the unknown or undocumented cause. Trauma with stone, thorn/cactus, rocket/firework, ball, glass, nail/finger also

presented high incidence in most of the articles. It was also referred in a prospective study, by Khokhar et al., that most of the traumas occur in rural areas (58%), in the middle-class (70%).⁽⁵⁾

Table 1
Origin of ocular traumas related to the formation of pediatric cataract, with references obtained from the articles surveyed

Etiology of pediatric cataract	TOTAL	%
Wooden stick ^(19, 20, 21, 23, 25, 26, 27, 28, 29, 33, 34)	934	37,73
Sharp object ^(13, 14, 22, 28, 29, 31, 33, 34)	272	10,98
Stone ^(5, 21, 23, 26, 28, 29, 30, 31, 33, 34)	176	7,11
Arch and arrow ^(5, 20, 26, 32)	77	3,11
Thorn ^(19, 23, 27, 34)	77	3,11
Rocket/fireworks ^(5, 25, 26, 27, 29, 31, 32)	51	2,06
Scissors ^(31, 33, 34)	47	18,98
Pen/pencil ^(19, 24, 29, 30, 33)	30	1,21
Ball ^(19, 20, 25, 28)	29	1,17
Glass ^(5, 20, 24, 25, 28, 31, 32)	29	1,17
Beat ^(22,29)	26	1,05
Cattle horn ^(25,28)	25	1,01
Missile ⁽²²⁾	23	0,92
Needle/nail ^(19, 20, 21, 33, 34)	20	0,80
Knife ^(19, 23, 24, 31, 33)	19	7,67
Shot ⁽²²⁾	18	0,72
Biscuit ^(19, 20)	18	0,72
Wire ^(21, 23)	17	0,68
Sports equipment ⁽³⁰⁾	16	0,64
Sports accident ^(22,30)	15	0,60
Finger ^(21, 25, 28, 33)	15	0,60
Traffic accident ^(22,24, 29, 31)	10	0,40
Sudden movement ⁽²³⁾	8	0,32
Flying object ⁽²²⁾	8	0,32
Wooden object ⁽³¹⁾	6	0,24
Others ^(20,21, 23, 25, 26, 27, 28, 30)	294	11,87
Unknown ^(5, 19, 20, 22, 23, 24, 25, 28, 29, 31, 33)	215	8,68
TOTAL	2475	100

The children from the Indian study of Gogate et al.⁽¹⁹⁾ were mostly from rural communities and from low socioeconomic status, therefore, presented more participants from agricultural activities and outdoor games.

Ram et al.⁽²⁰⁾ evaluated children and adolescents with traumatic cataract between 1 and 15 years of age living in Northern India. In this series, 85% of the children were male, which can be explained by the greater practice of sports and outdoor activities performed by boys, making them more susceptible to ocular trauma. Traumas with bow and arrows and fireworks generally occurred during the season of Indian festivals such as Dusshera and Diwali, in which these objects are used.

Researcher Leal et al.⁽⁴⁾ reported a frequency of 90% of perforating trauma and 10% of blunt trauma in children with traumatic cataract. The identified cases of acquired cataract have a higher occurrence in children aged approximately three years old, a sensitive period of childhood visual development.⁽⁶⁾ On the other hand, Johar et al.⁽²¹⁾ study aimed to examine the causes of childhood cataracts and to identify preventable factors. Children

and adolescents between 10 months and 15 years old from four western states of India participated in the study, and 75% of the children with traumatic cataract were from urban areas, which differs from the Khokhar et al.⁽⁵⁾

In the study of Niiranen et al.⁽²²⁾ among the population of 20 children with traumatic cataract, 16 (80%) were boys. The distribution by age was similar to that from other series. Among girls, accidents occurred equally at all ages, while among boys, the risk of eye trauma increased at the age of 8 years old, which differs from the Zimmerman-Paiz et al.⁽⁶⁾ Apparently in the first school years boys are less exposed to traumatic activities because the frequency of traumatic cataract is very low until the age of seven.

Gradin et al. study⁽²³⁾ was composed of 147 boys and 68 girls. This study evaluated the visual results and complications after intraocular lens placement of patients undergoing surgery after the diagnosis of traumatic cataract in sub-Saharan African children, aged less than 16 years old.

The study by Reddy, Ray et al.⁽²⁴⁾ reviewed 25 cases of traumatic cataract in children and adolescents under 17 years of age. The study was conducted through electronic medical records of a Texas health institution and presented as objectives to describe the presentation, treatment and visual prognosis from these patients.

Shah⁽²⁵⁾ performed a retrospective study that evaluated 354 patients aged 0 to 18 years who were victims of ocular trauma which evolved with traumatic cataract. From the evaluated eyes, 287 (82.6%) had perforating ocular lesions and 67 (17.3%) had blunt eye lesions, similar to the findings of Leal et al.⁽⁴⁾ From the analysis of socioeconomic and demographic data it was observed that the vast majority of the children were from low socioeconomic level (74.5%) and 327 patients (92%) lived in rural areas. These aspects were not related to the final visual prognosis after the surgical treatment of traumatic cataract. This study presented similarities and differences to the Khokhar's et al. article.⁽⁵⁾

With the goal to evaluate the presentation, conduct and clinical evolution of traumatic cataract in children, Krishnamachary et al.⁽²⁶⁾ evaluated 137 children and adolescents under the age of 16 who presented cataract after ocular trauma between January 1988 and December 1993. The group was composed of 27 girls and 110 boys. Most of the lesions were caused by arc and arrow (54.7%).

Khokhar's et al. study⁽⁵⁾ evaluated the epidemiology and the medium-term outcome from the treatment of blunt and perforating ocular lesions which resulted in infantile traumatic cataract. It was performed the retrospective analysis of the ocular trauma of 57 patients under the age of 16 who developed cataract. Arc and Arrow were the most frequent causal agents, in agreement with the study of Krishnamachary et al.⁽²⁶⁾, and open eyeball injury was 3 times more common than blunt trauma as the cause of cataract.

Eckstein's et al. article⁽²⁷⁾ goal was to identify the causes of childhood cataract in South India, highlighting factors which could prevent this type of trauma. It was identified that most of the traumas occurred in boys (75%) coming from rural areas (75%), similar to the Khokhar et al.⁽⁵⁾ and Shah et al.⁽²⁵⁾ Perforating traumas were more documented and occurred mainly during the leisure time of children (91%).

In order to validate a pediatric ocular trauma scale, a way of calculating the visual prognosis after traumatic cataract, the Shah et al.⁽²⁸⁾ performed a Cohort study at the Eye Hospital of western India, in which 1,070 patients from 0 to 18 years were evaluated. Demographic factors including socioeconomic status and type of residence were analyzed. The majority of patients with traumatic cataract were male (71.8%), of lower-income (74.5%) and from

rural areas (92%). The wooden stick (51.4%) was the main object involved in the trauma. It was concluded that the proposed scale has high sensitivity and high specificity when compared to OTS (Ocular Trauma Score).

Du et al.⁽²⁹⁾ and team described a study conducted at the largest ophthalmological center in East China over a five-year period, on the treatment of traumatic cataract of mechanical origin. The demographic and etiological factors were observed, and the authors advocated the importance of knowledge for both health and education, in order to improve the prevention of these accidents. Sharp objects were the major cause, totaling 40.2%, in which were considered: scissors, needle, knife and metal blade. The majority were male, similar to previous studies, and presented a higher incidence in the range of 2 to 8 years old.

A 10-year retrospective study was conducted in Malaysia by Adlina et al.⁽³⁰⁾, with 29 children and adolescents under 17 years of age and with traumatic cataract. In this study it was also observed a higher number of male cases, with a predominance of right eye lesions (62.07%), and main cause of organic foreign body (24.14%).

Another study which evaluated the evolution of visual acuity after traumatic pediatric cataract and the mechanism which the trauma occurred, presented sharp metal and scissors (21% of all cases) as main causes. It was performed by the Staffieri et al.⁽³¹⁾, with varied final visual acuity evolution after treatment.

Sminia et al.⁽³²⁾ described 5 cases of intraocular lens implantation (Artisan aphakia IOL) after traumatic cataract due to penetrating ocular trauma, without capsular support, by various mechanisms of trauma. This study presented the following causes: thorn, arrow, copper wire, glass and fireworks; concluded that the implantation of Artisan aphakia IOL can be considered a therapeutic option for children with aphakic eyes and without capsular support, post-trauma.

Zhu L, et al.⁽³³⁾ developed a study to compare the ocular trauma score (OTS) scale and the ocular traumatic ocular trauma (POTS) scale in cases of penetrating ocular trauma. A total of 102 children were evaluated, 65 boys (63.7%) and 37 girls (36.3%). The scissors (38.2%) and wooden stick (13.7%) were more prominent as objects causing the trauma, followed by nail/needle (9.8%), pointed object (7.8%), glass (6.9%), stone (2.9%), pencil/pen (6.9%), knife (5.9%), finger (1%), toy gun (1%) and key (1%).

Another observational study from the MEMON group,⁽³⁴⁾ with a total of 41 patients, 31 boys and 10 girls, with unilateral traumatic cataract, observed a more affected age between 5 and 14 years old (58.5%) and presented as its main cause wooden stick in 13 eyes (31.7%), thorn in 9 eyes (22%) and stone in 7 eyes (17.1%). The time between trauma and cataract surgery did not influence final visual acuity and was advocated a measure of protection in sports, activities and education to avoid ocular trauma.

Finally, it is estimated that in up to 90% of cases eye trauma is preventable.⁽¹²⁾ Public health campaigns related to the counseling of parents, teachers and also children, by ophthalmologists, pediatricians and health professionals could prevent and avoid ocular trauma.^(9,15) Supervision of children by attentive adults, especially during risky activities such as outdoor activities, crafts and household activities, could reduce the incidence of eye injuries.

CONCLUSION

The most prominent types of trauma in the analyzed studies were those with pieces of wood and sharp objects. It was observed that boys were more affected and there was a relation

with practice of intra and extra domiciliary activities, as well as in rural and urban environment.

It was verified that it is essential to prevent factors which increase the chances of occurrence of pediatric cataract, especially that of traumatic factors, since this is one of the main causes of cataract and one of the simplest prevention factors.

Further research which presents detailed information on the types and agents of traumatic ocular damage in children needs to be elaborated with the goal of developing specific initiatives to prevent this type of injury.

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