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Artigo Original

Trends in the epidemiology of ocular trauma: comparison of two periods of time

Rita Massa[1], Natália Ferreira[2], Angelina Meireles[3]
[1]Interno Complementar de Oftalmologia
[2]Assistente Hospitalar Graduada de Oftalmologia
[3]Assistente Hospitalar Graduada Sénior de Oftalmologia

RESUMO

O **objectivo** deste estudo é identificar as características epidemiológicas e definir a tendência do perfil epidemiológico do trauma ocular ao longo do tempo, no Norte de Portugal.
Métodos: Foi realizado um estudo retrospectivo e comparativo de todos os traumatismos oculares avaliados no Centro Hospitalar do Porto / Hospital de Santo António, no Porto, entre 2004 e 2013: os casos que ocorreram de 2004 a 2008 foram incluídos no grupo 1 enquanto que aqueles que ocorreram de 2009 a 2013 constituiram o grupo 2. A análise estatística foi realizada com SPSS.
Resultados: Registaram-se 476 lesões oculares de 468 doentes durante um período de 10 anos. O grupo 1 compreendeu 216 olhos de 212 doentes e o grupo 2 incluiu 260 olhos de 256 doentes. A maioria das lesões ocorreu no sexo masculino em proporção semelhante nos grupos 1 e 2 (82,4% vs 81.2%, respectivamente),p=0.795. A maioria dos traumatismos ocorreu em casa: 48.6% e 49.8% dos casos no grupo 1 e 2, respectivamente. Os acidentes laborais foram responsáveis por 18.1% e 26.5% dos casos no grupo 1 e no grupo 2 (p=0.031). As rupturas corresponderam a 27.8% e a 33.1% dos casos no grupo 1 e 2, respectivamente (p=0.004).
Conclusões: Verificou-se um aumento significativo das lesões em contexto laboral e nos traumatismos abertos; no entanto, os traumatismos ocorridos em casa mantiveram-se como os mais frequentes. É essencial alargar as medidas de protecção a actividades que não eram anteriormente o alvo das estratégias de segurança no sentido de evitar o "fardo" físico, psicológico e socio-económico do trauma ocular.

Palavras chave
Lesão ocular; morbilidade ocular; acidentes domésticos; acidentes laborais; dispositivos de protecção ocular.

ABSTRACT

The **purpose** of this study is to identify the epidemiological characteristics and define the trend of epidemiological profile of ocular trauma over time in the North of Portugal.
Methods: A retrospective and comparative study of all ocular traumatisms evaluated at Centro Hospitalar do Porto / Hospital de Santo António in Oporto, between 2004 and 2013 was performed: those cases which occurred from 2004 to 2008 were assigned to group 1 and those that occurred from 2009 to 2013 were assigned to group 2. Statistic analysis was done with SPSS.
Results: There were 476 eye injuries from 468 patients over the 10-year period. The group 1 comprised 216 eyes of 212 patients and the group 2 comprised 260 eyes of 256 patients. The majority of injuries occured in men with similar proportion in groups 1 and 2 (82.4% vs 81.2%,

respectively),p=0.795.The majority of traumatisms took place at home: 48.6% and 49.8% of cases in group 1 and in group 2, respectively. Work-related accidents were responsible for 18.1% and 26.5% of cases in group 1 and in goup 2, (p=0.031).Ruptures were present in 27.8% and in 33.1% of cases in group 1 and 2, respectively (p=0.004).
Conclusions: There was a significant increase in work-related trauma and in open-globe injuries. However, home related trauma remains the most frequent one. It is essential to broaden the protective measures to activities that were not previously the target of safety strategies in order to avoid the physical, psychological end socioeconomic burden of ocular trauma.

Key-words
Eye injury; ocular morbidity; home accidents; work-related accidents; eye protective devices.

INTRODUCTION

Ocular trauma remains an important cause of morbidity with a huge physical, psychological and socioeconomic impact. Despite all medical and surgical improvements, ocular trauma is still one of the most common causes of ocular globe loss. It is a significant public health issue as it has considerable human costs and is generally preventable[1-3].

Every year, approximately 2 million eye injuries occur in the United States and more than 40 thousand result in permanent visual impairment[3-5]. In 2008, Cillino *et al*. estimated an annual incidence rate of hospitalized eye injury of 4.9 per 100 000 in Italy[3]. In 2010, Saeed et al. and Raymon et al calculated an incidence of 18.0 per 100 000 and 53.3 per 100 000 respectively in Ireland and Australia[6,7].

Severity of ocular trauma varies widely from corneal erosions to the presence of intraocular foreign bodies requiring posterior segment interventions[8]. Multiple surgical approaches are frequently needed and generally have a poor prognosis. Consequently the best approach to ocular trauma is its prevention. It is essential to know its epidemiological profile in order to inform and educate about high-risk activities and high-risk behaviours.

The majority of studies published describe the epidemiological profiles of ocular trauma in a short period of time, therefore it is difficult to detect trends in the evolution of ocular trauma.

Epidemiological profile of ocular trauma varies widely between countries and even within the same country according to the main socioeconomic activities developed in a certain region.

There is a lack of information concerning the epidemiological characteristics of ocular trauma in Portugal.

The primary aim of this study is to identify the epidemiological characteristics of ocular trauma in the North of Portugal and the secondary is to verify if there was a significant change in the last years. The Centro Hospitalar do Porto / Hospital de Santo António is a major university hospital in Porto and shares with another tertiary hospital the main referral center for globe injuries in this area of the country. During the time of the study, it had a 24-hour or 12-hour eye Emergency Department every two weeks.

METHODS

Porto is located in Northern Portugal and is the second largest city in Portugal with 1.3 million inhabitant in a metropolitan area of 189 Km . The main economic activities are: business, industries, services and tourism. In the North of Portugal, with about 21 thousand Km area and 3.7 million inhabitants, rural and factory activities as well as services predominate.

During the period of this study, there were no significant changes in population.

This study retrospectively reviews the epidemiological characteristics of patients with an open-globe injury who underwent a primary surgical repair and those with closed--globe trauma with posterior segment involvement in the last ten years.

The authors adhered to the tenets of the Declaration of Helsinki. Subjects have given their informed consent and the study protocol has been approved by the Institute's committee on human research.

All the eyes evaluated and registered in the ocular traumatology database have been referred to the Ocular Traumatology and Retina Unit of the Ophthalmology Department of Centro Hospitalar do Porto / Hospital de Santo António between 2004 and 2013 and were included and assigned to one of two groups: those injuries occurred from 2004 to 2008 were assigned to group 1 and those that occurred from 2009 to 2013 were assigned to group 2. The two groups

were compared in order to define the trend of ocular trauma epidemiological profile over time.

Epidemiological characteristics extracted included: gender, age, place of injury, relation to work-activity, cause and injury type. The globe injuries were classified according to Birmingham Eye Trauma Terminology (BETT) system as contusions (when there was no wound of the eye wall), lamellar lacerations (when there was a partial-thickness wound of the eye wall), ruptures (when there was a full-thickness wound of the eye wall caused by a large blunt object) and lacerations (when there was a full-thickness wound of the eye wall caused by a sharp object). This category was further subdivided into penetrating injury (when an entrance wound was present) with intraocular foreign body (IOFB) when one or more foreign objects were present (it is technically a penetrating injury but is considered separately because it has different clinical implications) and perforating injury (both an entrance and an exit wound were present)[9,10].

All patients were asked about alcohol and drug abuse at presentation in the Emergency Department but serologic tests were performed only in selected cases for legal purposes.

Statistic analysis was done with SPSS version 22.0 (SPSS, Inc., Chicago, IL, US). Statistical analyses of the quantitative data, including descriptive statistics and parametric and non-parametric comparisons were performed for all variables. Frequency analyses were performed using Pearson's Chi square test. All P-values were two-sided and P-values less than 0.05 were considered statistically significant.

RESULTS

There were 476 eye injuries from 468 patients over the 10-year period. The group 1 comprised 216 eyes of 212 patients and the group 2 comprised 260 eyes of 256 patients. The demographic data are shown in Table 1.

Table 1 | Distribution of groups of ocular traumatisms by gender and age

	Groups of ocular traumatisms (eyes)		Total (%)
	Group 1	Group 2	
Male	178 (82.4%)	211 (81.2%)	389 (81.7%)
Female	38 (17.6%)	49 (18.8%)	87 (18.3%)
Total (%)	216 (45.4%)	260 (54.6%)	476 (100%)
<18 years	21 (9.7%)	30 (11.5%)	51 (10.7%)
18-64 years	139 (64.4%)	177 (68.1%)	316 (66.4%)
>65 years	56 (25.9%)	53 (20.4%)	109 (22.9%)
Total (%)	216 (100%)	260 (100%)	476 (100%)

The majority of injuries occurred in men with similar proportion in groups 1 and 2 (82.4% vs 81.2%, respectively). There was no significant difference between the two groups (p=0.795, Pearson's Chi square test)

The patients age ranged from 1 to 94 years old with an average of 47.7±20.4 years in group 1 and 45.9±21.7 years in group 2; there was not a stastically significant difference between the two groups (p=0.356, Student's t test for independent samples). Moreover, 64.4% of patients in group 1 vs 68.1% of patients in group 2 had an age range from 18 to 64 years old; 9.7% vs 11.5% of injuries occurred in people under 18 years old in group 1 and 2 respectively and

Table 2 | Distribution of groups of ocular traumatisms by place and mechanism/object of traumatism

	Groups of ocular traumatisms (eyes)		Total
	Group 1	Group 2	
Place of traumatism			
Home	105 (48.6%)	125 (49.8%)	230 (49.3%)
School/Sports/ Leisure	30 (13.9%)	32 (12.7%)	62 (13.3%)
Industry	27 (12.5%)	54 (21.5%)	81 (17.3%)
Rural area	24 (11.1%)	20 (8.0%)	44 (9.4%)
Street/Other	30 (13.9%)	20 (8.0%)	50 (10.7%)
Total	216 (100%)	251 (100%)	467 (100%)
Work-related accidents			
Yes	39 (18.1%)	67 (26.5%)	106 (22.6%)
No	176 (81.9%)	186 (73.5%)	362 (77.4%)
Total	215 (100%)	253 (100%)	468 (100%)
Mechanism/object of traumatism			
Hammer/metal	10 (4.7%)	22 (8.6%)	32 (6.8%)
Dawel	4 (1.9%)	13 (5.1%)	17 (3.6%)
Explosion and gunshot	14 (6.5%)	18 (7.0%)	32 (6.8%)
Blunt object	83 (38.6%)	80 (31.2%)	163 (34.6%)
Sharp object	59 (27.4%)	80 (31.2%)	139 (29.5%)
Mower/Other	11 (5.1%)	9 (3.5%)	20 (4.2%)
Fall	27 (12.6%)	29 (11.3%)	56 (11.9%)
Car accident	7 (3.3%)	5 (2.0%)	12 (2.5%)
Total	215 (100%)	256 (100%)	471 (100%)

25.9% vs 20.4% involved people over 64 years old in group 1 and group 2; there was no significant difference between the two groups and the age range (p=0.334, Pearson's Chi square test).

Almost half of the trauma took place at home: 48.6% vs 49.8% of cases in group 1 and group 2, respectively. It was found a higher number of cases in group 2 as compared to group 1 in the industrial environment (21.5% vs 12.5%), while in rural areas the opposite was the case (8% vs 11.1%) - table 2. There was a statistically significant difference concerning the place of ocular trauma in the two analyzed groups (p=0.031, Pearson's Chi square test).

Work-related accidents were responsible for 18.1% vs 26.5% of cases in group 1 and group 2 respectively (table 2), which was stastitically significant (p=0.032, Pearson's Chi square test).

The most frequent mechanism of ocular trauma in both groups was a blunt object (38.6% vs 31.2% in group 1 and 2 respectively) followed by a sharp object (27.4% vs 31.2% in group 1 and 2 respectively) and falls contributed to 12.6% vs 11.3% of cases - table 2. The difference between the two groups was not statistically significant (p=0.083, Pearson's Chi square test).

The open-globe injuries were the majority in both groups (72.2% vs 86.5% in group 1 and 2 respectively) with a open: close ratio of 2.5:1 in group 1 and 6.4:1 in group 2. - table 3. The difference between the two groups was statistically significant (p<0.001, Pearson's Chi square test).

Table 3 | Distribution of groups of ocular traumatisms by type of traumatism, according to BETT system and by detection of alcohol or drugs.

	Groups of ocular traumatisms (eyes)		Total
	Group 1	Group 2	
Type of traumatism			
Open-globe	156 (72.2%)	225 (86.5%)	381 (80.0%)
Closed-globe	60 (27.8%)	35 (13.5%)	95 (20.0)
Total	216 (100%)	260 (100%)	476 (100%)
BETT system			
Contusion	60 (27.8%)	35 (13.5%)	95 (20.0%)
Rupture	60 (27.8%)	86 (33.1%)	146 (30.7%)
IOFB	46 (21.3%)	61 (23.5%)	107 (22.5%)
Penetrating	41 (19.0%)	60 (23.1%)	101 (21.2%)
Perforating	9 (4.2%)	18 (6.9%)	27 (5.7%)
Total	216 (100%)	260 (100%)	476 (100%)
Detection of alcohol and/or drugs			
No	173 (80.1%)	226 (86.9%)	399 (83.8%)

According to BETT system, ruptures were present in 27.8% and in 33.1% of cases in group 1 and 2 while penetrating injuries were documented in 19.0% and in 23.1% of cases in group 1 and 2, respectively- table 3. The difference between the two groups was statistically significant (p=0.004, Pearson's Chi square test).

Alcohol and drugs were not detected in 80.1% and in 86.9% of cases in group 1 and in group 2, respectively. There was a significant difference between the two groups (p<0.001, Pearson's Chi square test).

DISCUSSION

Despite being one of the most common causes of ocular globe loss and Ophthalmology Emergency Department admissions, there is a lack of information about epidemiology of ocular trauma.

Some studies have evaluated epidemiological profiles of ocular trauma but to our knowledge this is the first study comparing epidemiological characteristics in two different periods of time in a population considered stable.

There are no official statistics concerning ocular trauma in Portugal.

In this study, men were affected more often than women, probably due to higher-risk activities performed by men, which is consonant with the literature about epidemiology of ocular trauma[11-14]. In both groups, the majority of ocular injuries occurred in economically active population which can be related to work-accidents as well as higher-risk activities such as high-risk sports and hobbies/activities performed at home. This phenomenon was also identified in other studies and did not change over time[3,15-16]. Older people were also commonly affected which can be associated with a higher prevalence of osteoarticular pathologies in this age group that can contribute to higher rates of falls and home accidents.

May *et al.*[13] reported that serious ocular trauma was no longer more frequent at work but happened more often at home[17] what was also verified in the two periods of our study. The high incidence of ocular injuries occuring at home is probably associated with lack of eye protection during those activities as they are usually considered low-risk.

An increase of eye injuries in industrial environment in the second group can correspond to a true increase of work-related injuries or may be related to a higher awareness of serious consequences of ocular lesions with a consequent increase of admissions to the Ophthalmology Emergency

Department. It was also found a relevant incidence of cases related to school, sports and leisure activities which supports the idea that is essential to provide information about the risks of certain activities[18].

The higher incidence of work-related accidents in the second group differ from other studies[17]. This finding emphasizes the need of a rigorous control by Labour Entities in order to evaluate the implementation of the appropriate eyewear protection in workplaces.

In our study, the type of mechanism/object responsible for the traumatic event did not suffer a change over time with blunt objects as well as sharp objects being the most common ones involved in the eye injuries. The injuries caused by car accidents remained stable probably due to the advent of laminated glass for windshields and tempered glass for the other vehicle windows and also to the educational campaigns related to the use of security belt that took place in the 90s[17].

Like other authors, such as He Chao in China[19] and Singh in India[8], we found an increase in all types of open--globe traumas in the second group, probably due to a higher incidence of work-related injuries or to the fact that open-globe injuries require almost always an urgent surgical approach that is available only in a tertiary hospital. The opposite was reported by Pandita A in New Zealand[20].

Acording to BETT system the ruptures were the most frequent type of open- globe trauma, which was also verified in Egypt[21], whilst Daza-Larque in the southeast of Spain[22], Singh in India[8] and Falcão in the Northwestern Portugal[17] reported that penetrating injuries were the most common ones.

Our study found a relatively low association of the traumatic events with the presence of alcohol or drugs (even lower in the second group), which can be related to a more rigorous control of workers but it's also important to remember that blood tests to detect the presence of alcohol or drugs were performed in only selected cases.

A limitation of this retrospective study concerns the fact that the information comes from only one center. The possible underestimated real incidence of ocular trauma could have occurred as some polytraumatized patients with life--threatning conditions with poor prognosis were not evaluated by an ophthalmologist. This study could have also excluded those patients who had minor ocular traumas that were treated in Ophthalmologists' offices or in Ophthalmology Departments of non-tertiary hospitals.

In spite of having some limitations, some conclusions can be accomplished.

The results showed the changes of epidemiological profile over time.

There was a significant increase in work-related ocular trauma and in open-globe injuries. According to our study, it is essential to broaden the protective measures to activities that were not previously the target of safety strategies such as those developed at home which was the most common place of ocular traumatisms in both periods of time.

Regardless of all medical and surgical developments in the last years, ocular trauma is still an important cause of morbidity with significant costs not only for the patient but also for the society.

Labour politics including the obligation of using protective eyewear should be implemented. Information concerning high-risk sports as well as high-risk activities performed at home should be spread in order to avoid the physical, psychological and socioeconomic burden of ocular trauma.

REFERENCES

1. Negrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiol 1998; 5:143-169.
2. Thylefors B. Epidemiological patterns of ocular trauma. Aust NZ J Ophthalmol 1992; 20:95-98.
3. Cillino S, Casuccio A, Di Pace F, Pillitteri F, Cillino G. A five-year retrospective study of the epidemiological characteristics and visual outcomes of patients hospitalized for ocular trauma in a Mediterranean area. BMC Ophthalmology 2008; 8:6.
4. McGwin G, Xie A, Owsley C. The rate of eye injury in the United States. Arch Ophthalmol 2005; 123 (7):970-976.
5. Mieler W. Overview of ocular trauma. Principles and Practice of Ophthalmology. 2nd edition. Philadelphia, WB Saunders Co, 2001;5179.
6. Saeed A, Khan I, Dunne O, Stack J, Beatty S. Ocular injury requiring hospitalisation in the South East of Ireland: 2001–2007. Injury 2010; 41 (1): 86-91.
7. Raymond S, Jenkins M, Favilla I, Rajeswaran D. Hospital-admitted eye injury in Victoria, Australia. Clin Experiment Ophthalmol 2010; 38 (6): 566–571.
8. Singh DV, Sharma YR, Azad RV, Talwar D. Profile of Ocular Trauma at Tertiary Eye Centre. K Science 2005; 7 (1):1-6.
9. Kuhn F, Morris R, Witherspoon CD, Heimann K, Jeffers JB, Treister G. A standardized classification of ocular trauma. Ophthalmology 1996; 103 (2):240-243.
10. Kuhn F, Morris F, Witherspoon CD, Mester V. The Birmingham Eye Trauma Terminology system (BETT). J Fr Ophtalmol 2004; 27 (2):206-210.
11. Fea A, Bosone A, Rolle T, Grignolo FM. Eye injuries

in an Italian urban population: report of 10620 cases admitted to an eye emergency department in Torino. Graefes Arch Clin Exp Ophthalmol 2008; 246 (2): 175–179.
12. Smith AR, O'Hagan SB, Gole GA. Epidemiology of open-and closed-globe trauma presenting to Cairns Base Hospital, Queensland. Clin Experiment Ophthalmol 2006; 34 (3): 252– 259.
13. May DR, Kuhn FP, Morris RE, Witherspoon CD, Danis RP, Matthews GP, Mann L. The epidemiology of serious eye injuries from the United States Eye Injury Registry. Graefes Arch Clin Exp Ophthalmol 2000; 238 (2): 153–157.
14. Kim JH, Yang SJ, Kim DS, Kim JG, Yoon YH. Fourteen-year review of open-globe injuries in an urban Korean population. J Trauma 2007; 62 (3): 746–749.
15. McCarty CA, Fu CL, Taylor HR. Epidemiology of ocular trauma in Australia. Ophthalmology 1999; 106 (9):1847-1852.
16. Fong LP. Eye injuries in Victoria, Australia. Med J Aust 1995; 162 (2):64-68.
17. Falcão M, Camisa E, Falcão-Reis F. Characteristics of open-globe injuries in Northwestern Portugal. Ophthalmologica 2010; 224:389-394.
18. Thompson CG, Kumar N, Billson FA, Martin F. The aetiology of perforating injuries in children. Br J Ophthalmol 2002; 86(8):920-922.
19. Cao H, Liping L, Zhang M. Epidemiology of Patients hospitalized for ocular trauma in the Chaoshan Region of China, 2001-2010. PLoS ONE. October 2012; 7(10):1-7.
20. Pandita A, Merriman M. Ocular trauma epidemiology: 10-year retrospective study. The New Zealand Medical Journal 2012; 125 (1348):61-69.
21. Soliman MM, Macky TA. Pattern of ocular trauma in Egypt. Graefes Arch Clin Exp Ophthalmol 2008; 246 (2): 205-212.
22. Daza-Larque AB, Peralta-Calvo J, Lopez-Andrade J. Epidemiology of open-globe trauma in the southeast of Spain. Eur J Ophthalmol 2010;20(3):578-583.

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CONTACTO
Rita Massa
Serviço de Oftalmologia
Hospital de Santo António - Centro Hospitalar do Porto
Largo Prof. Abel Salazar
4099-001 Porto
ritamassa@gmail.com