








Primary causes of emergency ophthalmological consultations at a tertiary care institution in Colombia

Principales causas de consulta de urgencias oftalmológicas en un instituto de atención terciaria en Colombia

Principais causas de atendimento oftalmológico emergencial em uma instituição de atenção terciária na Colômbia

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ABSTRACT

Introduction. Several ophthalmological conditions are causes of consultations to the emergency services. The objective of this study was to determine the most common causes of consultation to the ophthalmological emergency service of a tertiary institution in Colombia and thus be able to explore in the future the possibility of identifying some preventive measures aimed at reducing the frequency of these causes.

Methodology. Retrospective descriptive study based on the records of patients attending the emergency department during 2014 and 2015, identifying the diseases based on the International Classification of Diseases (ICD-10) codes.

Results. 9,088 and 8,162 records were identified for 2014 and 2015, respectively. The most frequent causes of ophthalmologic urgency consultation for the year 2014 were: corneal or conjunctive foreign body with 20.2 %, acute conjunctivitis not specified 11.3 %, conjunctival trauma and corneal abrasion 8.3 %, conjunctival haemorrhage 5.8 % and corneal burns 4.7 %. In 2015 the causes were: foreign body in the cornea or conjunctiva (23.6 %), conjunctival trauma and corneal abrasion (9.0 %), acute unspecified conjunctivitis (8.9 %), conjunctival hemorrhage (4.4 %), and corneal burns (4.0%).

Discussion. The most frequent causes of consultation with ophthalmologic emergencies included trauma and infections of the anterior segment of the eye.

Conclusions. There is a possibility of identifying some preventive measures (adequate protection elements, behavior protocols in situations of risk, etc.) that help to reduce the frequency of eye traumas and minimize the risk of infections. There is room for more studies in which the specific mechanisms of these injuries are analyzed.

Key words: Emergencies; Ophthalmology; Eye Burns; Corneal Diseases; Eye Injuries; Eye Foreign Bodies; Conjunctivitis.

RESUMEN

Introducción. Diversas condiciones oftalmológicas son causas de consultas a los servicios de urgencias. El objetivo de este trabajo fue determinar las causas más comunes de consulta al servicio de urgencias oftalmológicas de una institución terciaria en Colombia y, así, poder explorar en el futuro la posibilidad de identificar algunas medidas preventivas dirigidas a disminuir la frecuencia de esas causas.

Metodología. Estudio descriptivo retrospectivo basado en los registros de pacientes que asistieron al servicio de urgencias durante los años 2014 y 2015. Las patologías se identificaron a partir de los códigos de la Clasificación Internacional de Enfermedades, CIE-10.

Resultados. Se identificaron 9,088 y 8,162 registros para los años 2014 y 2015, respectivamente. Las causas de consulta a urgencias oftalmológicas más frecuentes para el año 2014 fueron: cuerpo extraño en la córnea o en la conjuntiva con un 20.2 % de los casos, conjuntivitis aguda no especificada con 11.3 %, traumatismo de la conjuntiva y abrasión corneal con 8.3 %, hemorragia conjuntival con 5.8 % y quemaduras corneales con 4.7 %. En el año 2015, las causas fueron: cuerpo extraño en la córnea o en la conjuntiva (23.6 %), traumatismo de la conjuntiva y abrasión corneal (9.0 %), conjuntivitis aguda no especificada (8.9 %), hemorragia conjuntival (4.4 %) y quemaduras corneales (4.0%).

Discusión. Las causas más frecuentes de consulta a urgencias oftalmológicas incluyeron los traumas y las infecciones del segmento anterior del ojo.

Conclusiones. Existe la posibilidad de identificar algunas medidas preventivas (elementos de protección adecuados, protocolos de conducta en situaciones de riesgo, etc.) que ayuden a disminuir la frecuencia de traumas oculares y minimicen el riesgo

de infecciones. Hay, entonces, cabida para más estudios en los que se analicen los mecanismos específicos de estas lesiones.

Palabras clave: Urgencias Médicas; Oftalmología; Quemaduras Oculares; Enfermedades de la Córnea; Lesiones Oculares; Cuerpos Extraños en el Ojo; Conjuntivitis.

RESUMO

Introdução. Várias condições oftalmológicas são causas de atendimento nos serviços de emergência. O objetivo deste trabalho foi determinar as causas mais comuns de atendimento oftalmológico emergencial em uma instituição terciária na Colômbia e, assim, poder explorar no futuro a possibilidade de identificar algumas medidas preventivas para reduzir a frequência dessas causas.

Métodos. Estudo descritivo retrospectivo baseado nos registros de pacientes que compareceram ao serviço de emergência oftalmológica durante os anos 2014 e 2015. As patologias foram identificadas a partir dos códigos da Classificação Internacional de Doenças, CID-10.

Resultados. Foram identificados 9,088 e 8,162 registros para os anos 2014 e 2015, respectivamente. As causas de atendimento oftalmológico emergencial mais frequentes em 2014 foram: corpo estranho na córnea ou na conjuntiva com 20,2 % dos casos, conjuntivite aguda não especificada com 11,3 %, trauma conjuntival e abrasão corneana com 8,3 %, hemorragia conjuntival com 5, 8% e queimaduras corneanas com 4,7 %. No ano 2015, as causas foram: corpo estranho na córnea ou na conjuntiva (23,6 %), trauma conjuntival e abrasão corneana (9,0 %), conjuntivite aguda não especificada (8,9 %), hemorragia conjuntival (4,4 %) e queimaduras corneanas (4,0 %).

Discussão. As causas mais frequentes de atendimento oftalmológico emergencial incluíram traumas e infecções do segmento anterior do olho.

Conclusões. Existe a possibilidade de identificar algumas medidas preventivas (elementos de proteção adequados, protocolos de conduta em situações de risco, etc.) que ajudem na redução da frequência de trauma ocular e para minimizar o risco de infecções. Há, então, espaço para mais estudos que analisem os mecanismos específicos dessas lesões.

Palavras-chave: Emergências; Oftalmologia; Quemaduras Oculares; Doenças da Córnea; Traumatismos Oculares; Corpos Estranhos no Olho; Conjuntivite.

Introduction

Patients with ophthalmological conditions consult emergency services either for traumatic injuries or for various illnesses with a variety of symptoms that usually affect the vision or are accompanied by pain (1-6). It has been calculated that the rate of ophthalmological emergencies is approximately between 1.2 % and 6% of all visits to general emergency rooms (1,2,7,8).

This study was conducted by means of an analysis of electronic records in order to determine the causes of emergency consultations in an ophthalmological

emergency room at a tertiary care institution in Floridablanca, Colombia. In Colombia, there are no epidemiological studies on the main pathologies in ophthalmological emergencies. The obtained data will help explore the possibility of designing some preventive strategies in the future to reduce the occurrence of these events.

Methodology

A retrospective, descriptive study based on the records of patients who sought emergency care at the selected institution in 2014 and 2015. Pathologies were identified based on the codes of the International

Classification of Diseases, ICD-10. To that end, the electronic clinical history system and the data exported to a spreadsheet on computer software (Excel by Microsoft Corporation, Redmond, Washington, US). Having consulted the ophthalmological emergency room service after an adequate assessment by the triage service, was considered the inclusion criterium. Exclusion criteria were not considered. Data from the first 20 recorded diagnoses were taken.

This study was considered not to have risk and was approved by the Institutional Ethics Committee. Statistical analyses were conducted using the statistical program, Stata (version 14), developed by Statacorp LLC (College Station, Texas, US).

Results

A total of 9,088 and 8,162 records were identified for 2014 and 2015, respectively.

The first twenty causes found in 2014 and 2015 represented 70 % of the ophthalmological visits to the emergency room.

Tables 1 and 2 list the first twenty causes of consultations for ophthalmological emergencies identified in each of the two analyzed years. **Figure 1** shows the top nine causes of consultations for both years, which, although they changed somewhat in the order of prevalence, were the same.

Table 1. Main causes of visits to the ophthalmological emergency room in 2014

Order	Code	Diagnosis	Number of cases	Percentage	Accumulated percentage
1	T150	Corneal foreign body	1,286	14.2 %	14.2 %
2	H103	Acute conjunctivitis	1,024	11.3 %	25.4 %
3	S050	Trauma to the conjunctiva and corneal abrasion	754	8.3 %	33.7 %
4	T151	Foreign body in the conjunctival sac	548	6.0 %	39.7 %
5	H113	Conjunctival hemorrhage	527	5.8 %	45.5 %
6	T261	Burn of the cornea and conjunctival sac	425	4.7 %	50.2 %
7	H000	Hordeolum	279	3.1 %	53.3 %
8	H160	Corneal ulcer	274	3.0 %	56.3 %
9	S051	Contusion of eyeball and orbital tissues	268	2.9 %	59.3 %
10	Z010	Eye and vision exam	161	1.8 %	61.0 %
11	H049	Disorder of the lacrimal apparatus	160	1.8 %	62.8 %
12	H200	Acute and subacute iridocyclitis	160	1.8 %	64.5 %
13	H101	Atopic acute conjunctivitis	150	1.7 %	66.2 %
14	H168	Other keratitis	127	1.4 %	67.6 %
15	H169	Unspecified keratitis	124	1.4 %	69.0 %

16	H041	Other disorders of the lacrimal gland	118	1.3 %	70.3 %
17	H118	Other specified disorders of the conjunctiva	110	1.2 %	71.5 %
18	H109	Unspecified conjunctivitis	99	1.1 %	72.6 %
19	H438	Other disorders of the vitreous body	94	1.0 %	73.6 %
20	H571	Ocular pain	82	0.9 %	74.5 %

Source: prepared by the authors.

Tabla 2. Main causes of visits to the ophthalmological emergency room in 2015

Order	Code	Diagnosis	Number of cases	Percentage	Accumulated percentage
1		Corneal foreign body	1,199	14.7 %	14.7 %
2		Trauma to the conjunctiva and corneal abrasion	734	9.0 %	23.7 %
3		Acute conjunctivitis	725	8.9 %	32.6 %
4		Foreign body in the conjunctival sac	443	5.4 %	38.0 %
5		Conjunctival hemorrhage	357	4.4 %	42.4 %
6		Burn of the cornea and conjunctival sac	323	4.0 %	46.3 %
7		Corneal ulcer	240	2.9 %	49.3 %
8		Eyeball contusion	230	2.8 %	52.1 %
9		Hordeolum	216	2.6 %	54.7 %
10		Acute and subacute iridocyclitis	209	2.6 %	57.3 %
11		Unspecified keratitis	147	1.8 %	59.1 %
12		Unspecified disorder of the lacrimal apparatus	132	1.6 %	60.7 %
13		Unspecified disorder of the conjunctiva	111	1.4 %	62.1 %
14		Eye and vision exam	100	1.2 %	63.3 %
15		Other disorders of the vitreous body	97	1.2 %	64.5 %

16	Post-surgery convalescence	93	1.1 %	65.6 %
17	Atopic acute conjunctivitis	92	1.1 %	66.7 %
18	Mucopurulent conjunctivitis	86	1.1 %	67.8 %
19	Other specific disorders of the conjunctiva	79	1.0 %	68.8 %
20	Vitreous hemorrhage	77	0.9 %	69.7 %

Source: prepared by the authors.

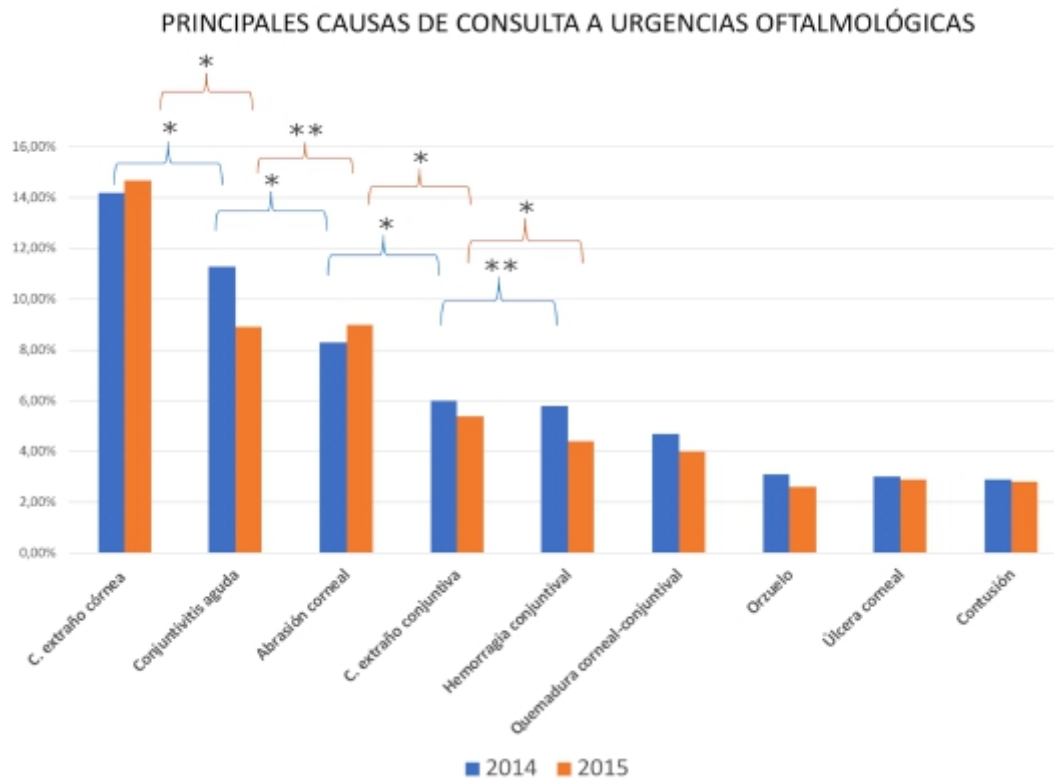


Figure 1. Most common causes of emergency ophthalmological consultations (2014-2015).
 * = Significant difference. **= Insignificant difference. Level of significance $p < 0.05$

Source: prepared by the authors.

It was found that, in 2014, traumatic causes corresponded to 36.1 % of the consultations. In 2015, it was 35.9 %.

Discussion

This study was conducted at a tertiary ophthalmological institution located in Floridablanca, a city in northeastern Colombia in the

department of Santander. It directly serves a population of just over one million residents (Metropolitan Area of Bucaramanga), but the area of influence extends to approximately four million people. The top three identified causes of consultations were the same for both studied annual periods. The diagnosis that remained in first place during both the analyzed years (2014 and 2015) was foreign bodies in the cornea. Acute conjunctivitis

moved from second place in 2014 to third in 2015. In turn, the diagnosis of trauma in the cornea/corneal abrasion moved from third place to second in 2015 (Tables 1 and 2).

In Colombia, there are no epidemiological studies about the main pathologies in ophthalmological emergencies.

This study's findings correlate with the largest study on this topic, published in 2016 by Channa et al. (5). In analyzing visits to emergency rooms related to eye conditions throughout the United States in a 6-year period (almost 12 million cases), these researchers found that the most common diagnosis was conjunctivitis (28 %), followed by corneal abrasions (13.7 %) and corneal foreign bodies (7.5 %). The results of a retrospective study conducted in Spain which compared the consultations for 1997 and 2005, were similar. Leal et al. found that the top three causes of emergency ophthalmological consultations in 1997 were corneal problems (27.8 %), conjunctivitis (19.6 %) and corneal foreign bodies (13.1 %); and, in 2005, the percentages were corneal foreign bodies (39 %), corneal problems (17 %) and conjunctivitis (7.3 %) (3). The same causes appeared as the first three causes of consultations, although with a variation in order, in studies conducted in Romania and Turkey, which were recently published (in 2016 and 2018, respectively) (6,9).

On the other hand, we found differences with the most frequent diagnoses for ophthalmological emergency services identified in studies in other countries. In a 2005 retrospective study conducted in Australia by Kumar et al. at an ophthalmological emergency center, it was found that the top five causes of consultations were: conjunctivitis, keratitis, cataracts, corneal abrasion and iridocyclitis. Diagnoses like conjunctivitis and corneal abrasion were also among the most frequent in the present study. On the other hand, we did not find cataracts among the 10 most common causes of emergency consultations identified at the institution. This is because patients are classified in the assessment prior to entering the emergency room in order to establish priorities (triage). Most non-urgent cases (such as cataracts) are redirected to an external consultation service. It is possible that the patients mentioned in the Kumar et al. study were seen in the same emergency room, which would explain the high percentage (4). A similar phenomenon was observed in the study published in 2019 by Domínguez-Serrano et al., conducted in two tertiary hospitals in Spain.

Although conjunctivitis and keratitis ranked in first and second place, subconjunctival hemorrhaging (hyposphagma) and posterior vitreous detachment placed in the next two places, relegating foreign bodies to a fifth place. Those researchers also identified blepharitis and dry eye among the top ten causes of visits to emergency rooms for ocular conditions. In analyzing this situation, they concluded that a very significant percentage of ocular conditions attended in the emergency room in fact were not urgent (73.4 %), and consequently suggested that measures be established in Spain to attain a more efficient service aimed at urgent pathologies, which would not consume unnecessary resources (10). In recent years, ophthalmological emergency services in the United Kingdom and other countries (like New Zealand), have shown a large increase in the number of consultations, and it was seen, just like in Spain, that a significant percentage of those are in fact not urgent problems which could be treated in external consultation services (11,12). Similar findings, although with less elevated percentages, have been published recently in the United States. A national study (with a sample of over 11 million cases) showed that nearly 25 % of a population of adults that had gone to an emergency room for some ophthalmological condition had received a diagnosis for a non-urgent condition (including conjunctivitis as non-urgent conditions) (13). Another previously cited study, also a national study in that country, which analyzed almost 12 million emergency consultations for ophthalmological conditions, found that, even including conjunctivitis as an emergency, 30.8 % of emergency consultations identified in all of the United States were not conditions that required care in that area and could have been referred to another department (5). The triage mechanism used in our institution, established in almost all emergency services in Colombia, controls this type of phenomena, which could consume more health care system resources in a less than optimally. The filter consists of assessing the pertinence of the consultation prior to admission; if there is no urgent condition, the patient is redirected to an external consultation service.

At the end of the 1980s in the United Kingdom, Edwards found that trauma constituted 65.6 % of the causes of ophthalmological consultations in emergency rooms (14). Similarly, in 2002 in France, Girard et al. reported that the number one cause for ophthalmological emergency consultations was related to traumatic injuries in approximately 66 % of cases (1). These percentages are higher than that found

in the present study (which was around 36 %). Meanwhile, in 2016, Channa et al. reported a very similar value to the one found in this study in their national study in the United States (36.6 %) (5). In 2008, Vieira in Brazil published that foreign bodies corresponded to 20% and other ocular trauma was 10% of emergency cases (15). Moreover, a study published in 2018 indicated that in France, 26.1 % of ocular emergencies corresponded to trauma (16). Other studies have found somewhat smaller percentages: in Saudi Arabia in 2014, ocular trauma was the cause of consultation in only 19.1 % of the cases (17).

With regard to the circumstances of the origin of ocular trauma, in Spain in the mid-1990's, León et al. found that job-related accidents ranked in first place (21.9%), followed by domestic accidents (21 %), leisure-time accidents (17 %), automobile accidents (15 %), accidents in sports-related activities (12 %) and trauma due to aggression or assault (10 %) (18). In 2008, Fea et al. published their results about a study on ocular trauma in Italy. The majority of the trauma occurred at work (57.1 %), or at home (35.1 %). Corneal foreign bodies were the first cause for consultations (49.5 %), followed by corneal abrasions (29.6 %) and conjunctival abrasions (16.5 %) (19). Sports-related trauma can cause serious ocular injuries, and in general, preventive measures are very effective (20). In Iran, Jafari et al found that trauma related to job activities was the most common cause of consultation at an ophthalmological emergency room (30.3 %). In that group, metal splinters ranked first. Only 18.6 % of the patients with ocular trauma used protective glasses (7).

A study in Lebanon found a reduction of penetrating ocular injuries from 1997 to 2012, and the authors attributed that phenomenon to public health campaigns undertaken with regards to safety elements when driving and in construction projects, which suggest a beneficial effect of these types of actions (2).

In the cohort included in this study, between 4 % and 4.7 % of emergency visits were related to burns of the ocular surface. There are not many studies that report the proportions of the frequency of corneal and conjunctiva burns with respect to the total number of ophthalmological emergencies, and results vary. While Girard et al. in France reported that 6.4% of ophthalmic emergencies were related to burns, recently other groups of researchers found smaller percentages: Samoilă et al in Romania found 1.3 %

and in a national study in the United States, Channa et al. found 0.9 % (1,5,9).

In order to obtain more detailed information from classified records according to ICD-10 codes, it is necessary to set parameters for more specific additional classifications which are available to the attending physician at the time of defining the diagnosis.

A weakness of the present study is that no additional data was collected regarding the specific mechanisms and circumstances of the traumatic injuries. Additionally, the retrospective design resulted in important variables (which could have been analyzed) not being collected in an appropriate manner. It is important for both ophthalmologists and patients to endeavor to improve preventing the main ocular pathologies that end up in emergency rooms, as many of them are major causes of partial or total impairments.

Conclusions

It was determined that the most frequent causes for emergency ophthalmological consultations at a tertiary care ophthalmological institution in Colombia included, in order of frequency, corneal trauma and infections of the anterior segment of the eye. The cornea and conjunctiva were ranked as the top compromised anatomical locations.

It is necessary to adjust the program that captures information on the diagnoses, expanding the specificity of the ICD-10 codes to be used in the institution.

A future study will determine the circumstances of ocular trauma in a specific manner in order to design preventive strategies that help reduce its frequency. Preferably, the study will have a prospective design to improve collecting the data on other additional variables (e.g., trauma mechanism, using or not using protective elements, etc.).

Conflict of Interest

None of the authors report conflicts of interest with regard to this paper.

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References

1. Girard B, Bourcier F, Agdabede I, Laroche L. [Activity and epidemiology in an ophthalmological emergency center]. *J Fr Ophtalmol.* 2002;25:701-11.
2. Salti HI, Mehanna CJ, Abiad B, Ghazi N, Raad S, Barikian A, et al. Changing trends in eye-related complaints presenting to the emergency department in Beirut, Lebanon, over 15 years. *J Ophthalmol.* 2018;2018:4739865
3. Leal MA, Beneyto P, Ibáñez MA, García A, Fernández MJ. ¿Han cambiado los pacientes oftalmológicos que acuden a urgencias? Estudio evolutivo entre los años 1997 y 2005. *Arch Soc Esp Oftalmol.* 2007;82:159-65.
4. Kumar NL, Black D, McClellan K. Daytime presentations to a metropolitan ophthalmic emergency department. *Clin Experiment Ophthalmol.* 2005;33:586-92.
5. Channa R, Zafar SN, Canner JK, Haring RS, Schneider EB, Friedman DS. Epidemiology of eye-related emergency department visits. *JAMA Ophthalmol.* 2016;134:312-9
6. Sen E, Celik S, Inanc M, Elgin U, Ozyurt B, Yilmazbas P. Seasonal distribution of ocular conditions treated at the emergency room: a 1-year prospective study. *Arq Bras Oftalmol.* 2018;81:116-9.
7. Jafari AK, Bozorgui S, Shahverdi N, Ameri A, Akbari MR, Salmasian H. Different causes of referral to ophthalmology emergency room. *J Emerg Trauma Shock.* 2012;5:16-22.
8. Baig R, Ahmad K, Zafar S, Khan NU, Ashfaq A. Frequency of ocular emergencies in a tertiary care setting in Karachi, Pakistan - It is time to reduce unnecessary visits. *J Pak Med Assoc.* 2018;68:1493-5.
9. Samoilă O, Ostriceanu S, Samoilă L. Epidemiology of ocular emergencies in Cluj ophthalmology clinic. *Rom J Ophthalmol.* 2016;60:165-9.
10. Domínguez-Serrano FB, Molina-Solana P, Infante-Cossío M, Sala-Turrens J, Seva-Silva N, Rodríguez-de-la-Rúa-Franch E. Ophthalmological emergencies. An epidemiological study: Are resources been used properly? *Arch Soc Esp Oftalmol.* 2019;94:211-7.
11. Siempis T. Urgent Eye Care in the UK Increased demand and challenges for the future. *Med Hypothesis Discov Innov Ophthalmol.* 2014;3:103-10.
12. Perumal D, Niederer R, Raynel S, McGhee CN. Patterns of ophthalmic referral and emergency presentations to an acute tertiary eye service in New Zealand. *N Z Med J.* 2011;124:35-47.
13. Stagg BC, Shah MM, Talwar N, Padovani-Claudio DA, Woodward MA, Stein JD. Factors affecting visits to the emergency department for urgent and non-urgent ocular conditions. *Ophthalmology* 2017;124:720-9.
14. Edwards RS. Ophthalmic emergencies in a district general hospital casualty department. *Br J Ophthalmol.* 1987;71:938-42.
15. Vieira GM. [One month in an eye emergency clinic in Brasilia]. [Article in Portuguese]. *Arq Bras Oftalmol.* 2007;70:797-802.
16. Agrinier N, Conart JB, Baudot A, Ameloot F, Angioi-Duprez K. [Epidemiology of patients with eye-related emergencies in a university hospital: A cross-sectional study identifying factors associated with true emergency]. *J Fr Ophtalmol.* June, 2018;41(6):546-53.
17. Alabbasi OM, Al-Barry M, Albasri RF, Khashim HF, Aloufi MM, Abdulaal MF, et al. Patterns of ophthalmic emergencies presenting to a referral hospital in Medina City, Saudi Arabia. *Saudi J Ophthalmol.* 2017;31:243-6.
18. León F, Taboada JF, Guimerá V. Traumatismos Oculares graves en España: Factores epidemiológicos, estudio de las lesiones y medidas de prevención., Barcelona: Vallirana; 1994. pp. 12-27.
19. Fea A, Bosone A, Rolle T, Grignolo FM. Eye injuries in an Italian urban population: report of 10,620 cases admitted to an eye emergency department in Torino. *Graefes Arch Clin Exp Ophthalmol.* 2008;246:175-9.
20. Ong HS, Barsam A, Morris OC, Siriwardena D, Verma S. A survey of ocular sports trauma and the role of eye protection. *Cont Lens Anterior Eye.* 2012;35:285-7.