



CODEN [USA]: IAJ PBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.2576708>Available online at: <http://www.iajps.com>

Research Article

**VISUAL OUTCOME AND CLINICAL FEATURES OF
PATIENTS HOSPITALIZED FOR OCULAR TRAUMA IN
KAUH, JEDDAH**¹Rabaa Alhibshi, ²Lina Musa, ³Maha Baabdullah, ⁴Aseelah Alrasheedi, ⁵Rafal Bantan, ⁶Hiba Kashif, ⁷Dr. Nizar Al-Hibshi.**Abstract:**

Background: Ocular trauma is a preventable global crisis of great importance, however there are nearly 1.6 million people consequentially blind as a result of its neglected manifestations. It occupies 7% of all bodily injuries and 10– 15% of all eye diseases. Hence not only causing blindness or visual morbidity but also resulting in immense physical and psychological costs on society and a financial burden on the health-care service system.

Aim: The aim of this study is to describe clinical features, analyze visual outcomes, make recommendations for the public health and provide clinical strategies for the sake of facilitating the composition of future OT related research and managing the rate of or preventing ocular trauma occurrences in the future.

Methods: This retrospective case series study reviewed Medical files of patients who have been admitted through both ER and the outpatient clinics at KAUH between 2010 and 2017 with ocular trauma. Patients of all ages who were admitted to the hospital with ocular injuries, listed under the category of: Hyphema, traumatic cataract, corneal laceration, orbital fractures, foreign body injuries, and had their investigation done at KAUH were included in this study. While those who were admitted without a file number and non-traumatic eye diseases or injuries that were due to surgical complication or a medical disease such as corneal ulcers, vitreous hemorrhage, ocular abrasions were excluded.

Results: Twenty-four medical records of ocular trauma patients between the year 2010 till 2017 were reviewed. Males formed 7% of them, 45.8% were in the pediatric age groups, 66.7% were none Saudi, 62.5% of the patients developed traumatic cataract as a major complication, and 45.8% were home related injuries. There was a significant relation between the age and the causes of the traumas, traumatic cataract and the time interval, and between duration of hospitalization with the time interval.

Conclusion: From this study it's determined that delay in presentation majorly for non-Saudi patients had significant effects on the final visual acuity. This study found that the most common cause of ocular trauma is home and neighborhood –related injuries followed by school related injuries, so it's important that parents and teachers always try to supervise their children and take away all objects that have the potential to inflict harm or injury.

Corresponding author:

Rabaa Alhibshi,

QR code



Please cite this article in press Rabaa Alhibshi et al., *Visual Outcome And Clinical Features Of Patients Hospitalized For Ocular Trauma In Kauh, Jeddah., Indo Am. J. P. Sci, 2019; 06(02).*

INTRODUCTION:

A worldwide concern, Ocular trauma is considered to be a significantly responsible yet preventable adversity in causing visual impairment, in addition to the psychological and social effects on the patient and his/her family, it also results in a noteworthy financial burden on the health-care service system [1,2].

It has been estimated that 55 million eye injuries occur worldwide each year, 19 million of the cases develop permanent unilateral visual impairment, nearly 2.3 million individuals suffer from bilateral decreased vision, 1.6 million cases of people who are blind due to ocular trauma, around 750,000 of the cases require hospitalization, and 200,000 are open global injuries [3,4]. Ocular trauma occupies 7% of all bodily injuries and 10–15% of all eye diseases [5].

Previous studies showed that males, younger (more active) age groups, people with lower socioeconomic status, those engaged in labor-intensive occupations, and people with lower levels of education are at a higher risk of ocular trauma [4,6,7].

The most common activities causing eye trauma are work-related, assault-related, and sports-related traumas [8]. according to the sources of ocular trauma foreign bodies, falls, being hit by an object, and contact with chemicals were the most frequent OT causing incidents [9]. The most prevalent types of ocular trauma complications include changes in refraction, traumatic cataract, and even retinal problems after severe trauma which may require urgent surgery with greater vision loss as a result of sharp object caused injuries [10].

Several epidemiological studies in the western region have reported the prevalence of ocular trauma, while knowledge of ocular trauma in the gulf region is sadly limited [10] in India it was found that in both urban and rural population, males and laborers have a higher risk of developing ocular trauma [11,12,13]. some studies of ocular trauma however have been done in the middle east, for example: a previous study done in Egypt showed that the majority of ocular traumas were due to assaultive injuries occurring generally in males [1]. Quite a few Studies were done in Arabian Gulf Countries, a Kuwaiti study revealed that toy guns are the most common reason for children's admission to the eye center [14], which goes hand in hand with a study done in Qatar that estimates that most of the injuries the pediatric age group acquires are preventable and are home related which reflects the importance of adult supervision and health education to reduce the occurrence and severity of the injures [15]. There are also a few researches done in Saudi Arabia: most ocular traumas were work related ,76.6% of these incidents were due to Projectile foreign bodies, use of pneumatic chisels was among the most

hazardous actions, and more than one third of all reported ocular traumas were because of not wearing eye protection. Preventable factors, such as negligence, were highly responsible. An educational health care program concerning safety is much to be applied, and hazardous machines should be replaced by safer ones

(12) Despite the grave importance of this topic, unfortunately there hasn't been enough light shed on it, so this report might hopefully help in widening our perspective towards this issue. The aim of this study is to describe clinical features, analyze visual outcomes, make recommendations for public health and clinical strategies for the prevention, management, and research of ocular trauma in the future.

METHODOLOGY:

The ethical institutional review board (IBR) in King Abdul-Aziz University Hospital Jeddah, KSA, approved this study to be conducted. This retrospective case series study reviewed Medical files of patients who have been admitted through both ER and the outpatient clinics at KAUH between 2010 and 2017 with ocular trauma. Patient of all ages admitted to the hospital with ocular injuries listed as: Hyphema, traumatic cataract, corneal laceration, orbital fractures, foreign body injuries and had their investigation done at KAUH were included in this study. While those who were admitted without a file number and non-traumatic eye diseases or injuries that were due to surgical complication or a medical disease such as corneal ulcers, vitreous hemorrhage, ocular abrasions were excluded.

The data was classified according to the age (pediatrics 0-14, adolescents 15-20, adults 21-59, and elderly 60 and above), gender (male, female), Nationality (Saudi, None-Saudi), level of education (none, primary school, middle school, high school, college, postgraduate), affected eye/s (unilateral, bilateral), type of ocular trauma (home and neighborhood-related, school-related, work-related, violence-related, traffic-related, sports-related), cause of the trauma (foreign body, sharp object, blunt object, fall, chemicals), time interval from the injury to hospital admission (0-24hrs,24-48hrs, 3-4 days, more than 4 days), duration of hospitalization (1- 3days, 4-7days), follow ups and the number of follow ups (1-3 times, 4-7 times, 8-10 times, more than 10), initial visual acuity score, type of treatment (surgery, medication, both), final visual acuity score, and finally complications if present.

Data collection has been gathered electronically by Excel. The statistical analysis was performed using the twenty third version SPSS software. The relation between the previously listed variables were analyzed

by the chi-square test. P-value less than 0.05 was considered significant.

RESULTS:

This study reviewed over 24 medical records of patients with ocular trauma during the past 7 years

from 2010 till 2017 at King Abdul-Aziz University Hospital. The majority of them were males 17 patients (70.8%) and 7 patients (29.2%) of them were females. The age and nationality distribution is summarized in table (1) as well as their education level. And the causes are mentioned in chart 1 bellow.

Table 1 distribution of age, nationalities, and education		
Variables	Categories	Numbers & Percentages
Age	0-14	11(45.8%)
	15-20	4 (16.7%)
	21-59	7 (29.2%)
	Above 60	2 (8.3%)
Nationality	Saudi	8 (33.3%)
	None Saudi	16 (66.7%)
Education	college	2 (8.3%)
	high school	4 (16.7%)
	kindergartens	3 (12.5%)
	middle school	5 (20.8%)
	none	4 (16.7%)
	post graduate	2 (8.3%)
	primary school	4 (16.7%)

Almost all the ocular injuries were unilateral that's 22 cases (91.6%), except two of them were bilateral injuries (8.3%). On the other hand, the types and the causes of the trauma are showed in the charts (1-2) bellow.

hospitalized around 1-3 days that's about 17 patients (70.8%) while only 7 patients (29.2%) were hospitalized 4-7 days. Only 4 of them (16.7%) didn't follow up on the ophthalmology clinic while the rest of them did follow up. And the number of the times of the follow up for those who did follow are showed in chart (3) bellow.

The study also indicated that most of the patients were

Chart 1

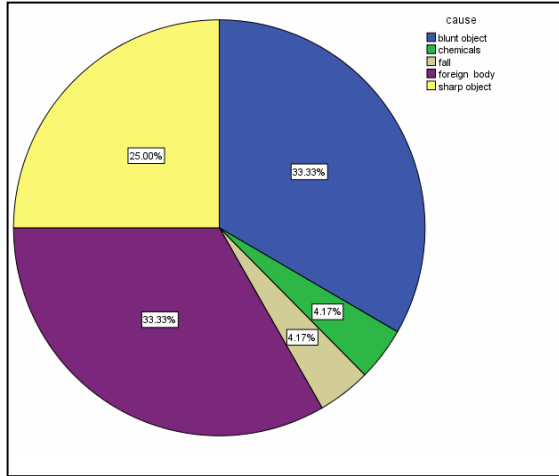


Chart 2

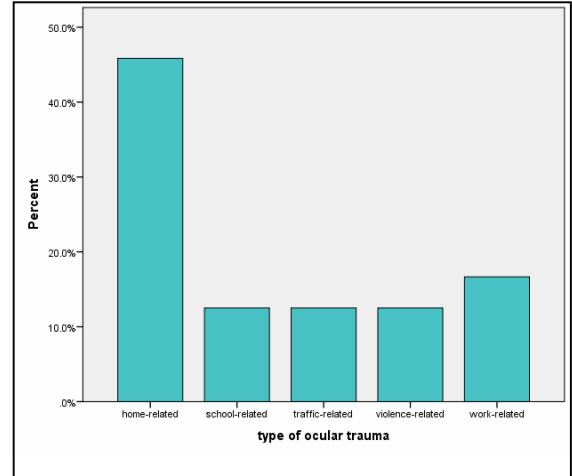


Chart 3

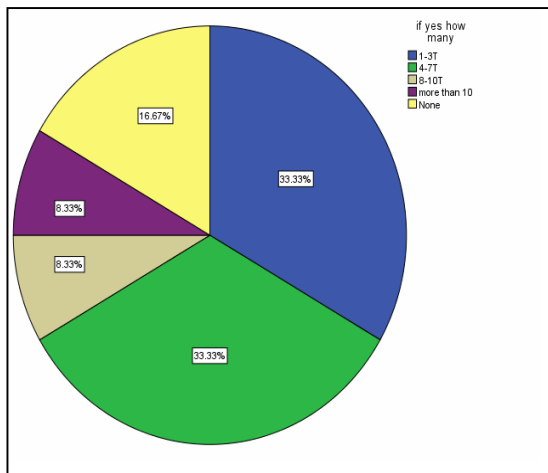


Table (2): All of the cases were managed by both surgery and medications that's about (95.8%) except for 1 case (4.2%) was managed with only medications. As for the major complications the study estimated that 15 patients (62.5%) developed traumatic cataract

while 9 of them (37.5%) didn't develop it. On the other hand, all of the patients developed decrease vision (95.8%) but one patient did not (4.2%). However, the study also showed other complications summarized in the table below.

Table (2) summary of the complications		
Compactions	Number	Percentage
Corneal chemical burn	1	4.2%
Esotropia, Hyperopia	1	4.2%
Esotropia, Loss of vision	1	4.2%
Hyphema	1	4.2%
No data	10	41.7%
Ocular laceration , no rupture and prolapse of intraocular tissue	5	20.8%
Ocular laceration , rupture and prolapse of intraocular tissue	1	4.2%
Ocular lacerations, rupture with prolapse of intraocular tissue	1	4.2%
Retinal detachment	1	4.2%
Retinal tear	1	4.2%
Vitreous hemorrhage	1	4.2%

Table (3): the table describes the relation between the age of the patient and the cause of the ocular trauma, which was statistically significant ($P < 0.05$). most of the ocular injuries within the pediatric age were caused by a blunt object (75%), followed by foreign body

injured patients (62%). However, adults from 21 – 59 years were reported to be mostly injured by sharp objects with a percentage weighing (83%). While, the elderly from 60 years old and above were either injured by falling (50%) or by a foreign body (50%).

Table (3): relation between the cause of ocular trauma and Age

Cause of ocular trauma	Age							
	0 – 14		15 - 20		21 - 59		60 and above	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Sharp object	0	0%	1	16.7%	5	83%	0	0%
Blunt object	6	75%	1	12.5%	1	12.5%	0	0%
Foreign body	5	62%	2	25%	0	0%	1	50%
Chemical	0	0%	0	0%	1	4.2%	0	0%
Fall	0	0%	0	0%	0	0%	1	50%
P-value	0.004							

Table (4): the table describes the relation between the type of the situation where the ocular trauma developed and the age group of the patients, which was statistically significant ($P < 0.05$). Work related injuries were only documented in the adult age group (21 to 59 years). While the violence related and the traffic related injuries were equally seen in all the three age groups (33.3%) and none of the injuries were seen above the age of 60. On the other hand, injuries related

to school were mostly seen in young adults between the ages of 15 to 20 (66.6%) the rest of the injuries were seen in the pediatric age group (33.3%). As for the home related ocular injuries, the results showed that the majority were in the pediatric age group (72.2%), as for the elderlies above 60 years old were (18.2%), and the remaining injuries (9.1%) were seen in the adult group between the ages of 21 to 59 years.

Table (4): relation between the type of ocular trauma and Age

		home- related	school- related	traffic- related	violence- related	work- related	
Age	0-14	Count	8	1	1	1	0
		% within type of ocular trauma	72.7%	33.3%	33.3%	33.3%	0.0%
	15-20	Count	0	2	1	1	0
		% within type of ocular trauma	0.0%	66.7%	33.3%	33.3%	0.0%
	21-59	Count	1	0	1	1	4
		% within type of ocular trauma	9.1%	0.0%	33.3%	33.3%	100.0%
	60 and above	Count	2	0	0	0	0
		% within type of ocular trauma	18.2%	0.0%	0.0%	0.0%	0.0%
P-value		0.023					

Table (5): the table describes the relation between time interval and traumatic cataract, which was statistically significant ($p < 0.05$). most of the patients who came to the hospital within 0-24hrs did not develop traumatic cataract (88.9%), while those who came

after the fourth day from the injury developed traumatic cataract (40%). As for the patients who came within the third and fourth day (13.3%) had traumatic cataract.

Table (5)			time interval		
			0-24hrs	3-4 days	more than 4 days
Traumatic cataract	No	Count	8	1	0
		% within traumatic cataract	88.9%	11.1%	0.0%
	Yes	Count	7	2	6
		% within traumatic cataract	46.7%	13.3%	40.0%
P value 0.027					

Table (6): describes the relation between duration of hospitalization and time of interval which was statistically significant ($P < 0.05$). Most of the patients came to hospital within 0-24hrs after they were injured (8 patients, 47.1%) and they were hospitalized for 1-3 days, and (7 patients, 100.0%) came also within 0-

24hrs who needed to be hospitalized for 4-7 days. Those who were hospitalized for 1-3 days either came within the third and the fourth day (3 patients, 17.6%) or after more than four days from the trauma (6 patients, 35.3%).

[Table6]: Relation between duration of hospitalization and time of interval				
Time of interval	Duration of hospitalization			
	1-3		4-7	
	Number	Percentage	Number	Percentage
0-24 hours	8	47.1%	7	100.0%
3-4 days	3	17.6%	0	0.0%
<4 days	6	35.3%	0	0.0%
P-value	0.016			

Table (7): The causes of ocular trauma in relation to the patient's educational level were statistically significant ($P < 0.05$). The most frequent blunt objects injuries were common in primary school (3 cases = 75.0 %). Foreign body injures were common among middle school patients (4 cases = 80.0 %), for the rest of the cases refer to the table below.

[Table 7] the relation between the cause of the trauma and the educational level of the patient								
Causes	education							Total
	none	kindergarten	Primary school	Middle school	high school	Coll ege	postgraduat e	
Blunt object	1(25%)	2 (66.7%)	3(75.0%)	0	0	2 (100%)	0	8
chemicals	0	0	0	1(20%)	0	0	0	1
fall	0	0	0	0	0	0	1 (50%)	1
Foreign bodies	0	1(33.3%)	1(25%)	4(80.0%)	1(25%)	0	1 (50%)	8
Sharp object	3(75%)	0	0	0	2(75%)	0	0	6
P value	0.03							

DISCUSSION:

The purpose of this study was to describe the clinical features of ocular trauma, analyze its visual outcome, and make recommendations for the sake of the public health as well as give a clinical approach for future prevention/treatment, and other upcoming studies on this topic.

The results of our study showed that the most frequent causes of ocular trauma were blunt objects (33.3%), foreign bodies (33.3%), and sharp objects (25.0%) which matches with the results of a study done in Italy [17]. However, in some studies done in Pakistan and Iran (18, 19) ocular traumas caused by sharp objects were more frequent than blunt ones. This difference could be justified by the variation in the population's geographic distribution, beliefs, dangerous activities, and working conditions, as well as the appliance of safety rules in their daily lives.

In our study, ocular trauma was predominantly found more in males than in females, which is similar to the results of other studies done in Qatar [1], Jordan [20], Iran [21], Texas [22], west India [23], and Italy.

Males are more exposed to the outdoors as well as occupational/environmental hazards (1,24), and are naturally more aggressive than females are, thus making them more prone to conceiving an ocular trauma injury.

We also found that the highest incident of ocular injuries occurred among the pediatric age group starting zero to fourteen years of age, which matched the results of the studies conducted in Qatar [1], Texas [22], Scotland [25], and the US [26]. Children in general are more susceptible to ocular injuries due to their natural sense of curiosity towards the world and their drive to imitate others without regard to the risks and outcomes, as they have limited common sense and immature motor skills. A study done in China showed a table for more than 10 countries estimating that children often get injured due to deficient self-care and lack in coordination (27,26,25), which agrees with our speculation. Although most eye injuries are avoidable by simple preventative measures, most of the ocular injuries reported in our results were within the pediatric age group and 75% of the cases were caused by a blunt object. This was found compatible with other studies' results that showed that trauma caused by a blunt object accounted for 54.65% of the cases in children, such injuries were related to games/toys accidentally hitting their eyes and bumping into doors or furniture while running around (28,29,30,31). Thus emphasizing that children are the most susceptible group to these injuries. That might be due to common dangerous household items left in reach while the child is under no serious supervision.

There have also been accounts of children or

adolescents conceiving ocular injuries at school. A study done in a public school concluded that all students experience anger (32,33), the majority however were boys mainly due to the rising testosterone levels and the heat from playing outside under the sun (34). In our study, primary school ages were commonly injured by a blunt object (37.5 %), which could have been caused by other students or even school objects like chairs tables, etc... As for middle school students, the injury was usually acquired by a foreign body (50.0 %), while high school students were mostly injured by sharp objects (50.0 %). Another research done in Qatar had a similar outcome concerning middle/high school students, this might be attributed to their impulsively aggressive behavior, naturally rebellious nature, and the deficiency of an effective system for student supervision in some gulf countries' schools. After the pediatric age group, came adults in conceiving ocular injuries, most of which were acquired during work hours.

Our results concluded that most of the ocular accidents were home/neighborhood related (45.8%), which is compatible with the outcome of studies reported in Canada [35], Pakistan, China, and Nigeria (36, 18).

Unlike a study that was done in North Jordan which showed that most eye injuries happened outside during physical activity [20] and that is due to the false widespread belief that homes are a nonhazardous environment, therefore require no supervision. Studies conducted in Scotland as well as previous reports have recognized homes an important location for the occurrence of serious ocular injuries (37,38,39). Seventy-five percent of the injuries acquired at home were seen in the pediatric age group and Eighteen and two tenths percent were seen in elderly above the age of sixty. A study done in China concluded that objects like toys, knives, and scissors were the reason that preschool children acquired such injuries at home (36). Studies done in the UK and Kuwait shared the same results (40,41). The use of domestic tools by pediatric age groups without supervision might explain these results. As for the elderly, patients age 60 and above either get injured by falling or by a foreign body. A study done in Iran showed that most injuries the elderly attain are due to falling (23,14). One of the causes could be malnutrition which could lead to vitamin D deficiency and cause osteoporosis. (42)

Ranking second in locations ocular trauma tends to occur was the work-environment (16.7%), which matched results with a study conducted in Australia 43. Hired individuals of ages twenty-one to fifty-nine often suffer from work-related injuries outside the house. According to S.G. Balla (1997), a study done in

an iron forging company reported a high rate of ocular accidents among their workers (16). These results reflect the poor safety measures, and lack of protective measures like not wearing eye goggles, and the absence of gloves or lab coats/protective gowns in chemical factories. Although providing protective materials is not enough, a safety measures educational program should be established to target high risk occupation employees. The remaining OT related accidents were equally distributed (12.5%) as: violence-related, traffic-related, and school-related accidents.

Our study found that illiterate patients were mostly injured by a sharp object, this might be due to the lack of awareness within their community regarding such topics. An Australian study indicated that the majority of those lower in level of education are at a higher risk of conjuring ocular injuries (43). That's related to our results in which the majority of these cases were below college level of education. Another study in Ghana found that women with no education or lower level of education had a higher risk of developing domestic violence related injuries (44). This indicates the importance of the education factor.

Greater ocular morbidity is associated with intraocular foreign bodies. Pathology may include corneal abrasion, laceration of the globe, traumatic cataract, and retinal detachment. We found that the time interval of intervention has a significant effect on the visual outcome in which most of the patients who took time to seek medical attention after their incidents, developed serious complications. As the results prove that all of those who came after the third (13.3%) or fourth day (40%) from the injury developed traumatic cataract, while those who came to the hospital within the first twenty-four hours didn't (88.9%). Previous studies, such as one conducted by Mehul [45] and another done in Taiwan [46], showed that the delay in presentation leads to prolonged inflammation and an increased risk of infection accompanied by tissue disorganization [47,48]. On the other hand, a study reported in north India did not find any significant association between these two variables [49]. We believe that these differences are due to the lack of a standard evaluation method that detects the severity of the injury, or could be due to less awareness in our society to seek medical attention immediately unless in severe cases. All Patients in our study who required 4-7 days of hospitalization, mostly sought faster medical service within 0-24hrs from the injury. Other studies stated that those patients who came for medical attention within 0-24hrs even required more days of hospitalization in which the mean was eight days. This might be explained by the severity of these injuries as the more severe the injuries are, the faster they seek

medical help, and the longer their stay is.

LIMITATIONS:

This study had several drawbacks, one of which was that the data was restricted as it was derived from a single hospital's records as well as the absence of a trauma center in this hospital. We also faced difficulty in data collection as most of the files were archived and contained limited information and many essential information regarding the patient's visual assessment such as initial and final visual acuity have been not recorded, thus restricting us on following up the long-term-associated visual outcomes using patient medical records. Another obstacle was the misplacement of some medical non-traumatic related eye diseases like ocular ulcers under the category of ocular trauma in the files records system leaving us no choice but to exclude them. Finally, the unavailability of medical records prior the year 2010.

RECOMMENDATIONS:

The hospital of King Abdul-Aziz university needs to improve its data entering system. The hospital should also change the way it deals with its patients and start treating them according to the severity of the situation. We suggest providing a safety measures program in work places (labs, factories, farms, etc...), conducting strict rules to prevent injuries at school, and raising awareness to minimize the incidence of ocular trauma. The development of major complications such as traumatic cataract was marked high in our results. Therefore, we need to establish a hospital trauma center to provide doctors/ nurses with ocular trauma diagnosis guide lines and urgently treat OT patients, even offering full ophthalmic examinations to those suffering minor ocular injuries, thus reducing the chances of ocular complications from occurring and any other further damages in the future.

CONCLUSION:

In this study it was found that the causes of ocular trauma rely on the patient 's age, gender, education, and environment. Children were the most affected among the age groups, most of the eye traumas occur in young males, those of lower levels of education were more susceptible to eye injuries, and the majority of ocular traumas take place at a home/neighborhood related environment. Almost all Ocular injuries can be prevented if the right precautions were taken, therefore the public should be made aware of the effects eye trauma has on the patient and his/her family, whether it be social, financial, or health concerned.

REFERENCES:

- Al-Mahdi HS, Bener A, Hashim SP. Clinical pattern of pediatric ocular trauma in fast developing country. *Int Emerg Nurs*. 2011;19:186–91. doi: 10.1016/j.ienj.2011.06.008. [PubMed] [Cross Ref]
- Danz W., Sr Ancient and contemporary history of artificial eyes. *Adv Ophthalmic Plast Reconstr Surg*. 1990;8:1–10. [PubMed]
- Négrel AD, Thylefors B. The global impact of eye injuries. *Ophthalmic Epidemiol*. 1998;5:143–69. doi: 10.1076/opep.5.3.143.8364. [PubMed] [Cross Ref]
- Wong TY, Tielsh JM. Epidemiology of ocular trauma. In: Tasman W, Jaeger EA (eds). *Duane's Clinical Ophthalmology*. Lippincott Williams and Wilkins, 1999; 1–13.
- Acar U, Tok OY, Acar DE, Burcu A, Ornek F. A new ocular trauma score in pediatric penetrating eye injuries. *Eye (Lond)* 2011;25:370–4. doi: 10.1038/eye.2010.211. [PMC free article] [PubMed] [Cross Ref]
- Loon SC, Tay WT, Saw SM, et al. Prevalence and risk factors of ocular trauma in an urban south-east Asian population: the Singapore Malay Eye Study. *Clin experiment ophthalmol*, 2009; 37, 362-7.
- Wang JD, Xu L, Wang YX, et al. Prevalence and incidence of ocular trauma in North China: the Beijing Eye Study. *Acta Ophthalmol* 2012;90:e61–e67. doi: 10.1111/j.1755-3768.2011.02230.x PubMed Google Scholar
- McGwin et al. 2005; Cillino et al. 2008; Gordon 2012; Mowatt et al. 2012; Madhusudhan et al. 2014; Northey et al. 2014.
- McGwin et al. 2005; Kuhn et al. 2006; Gordon 2012; Northey et al. 2014.
- Hassan Hashemi, Mehdi Khabazkhoob, Mohammad Hassan Emamian, 1 Mohammad Shariati, 2 Saman Mohazzab- Torabi, and Akbar Fotouhi 3 Past History of Ocular Trauma in an Iranian Population-Based Study: Prevalence and its Associated Factors
- Dandona L, Dandona R, Srinivas M, et al. Ocular trauma in an urban population in southern India: the Andhra Pradesh Eye Disease Study. *Clin Experiment Ophthalmol* 2000;28(5):350–356. [Google Scholar]
- Krishnaiah S, Nirmalan PK, Shamanna BR, et al. Ocular trauma in a rural population of southern India: the Andhra Pradesh Eye Disease Study. *Ophthalmology* 2006;113(7):1159–1164. [Google Scholar]
- Nirmalan PK, Katz J, Tielsch JM, et al. Ocular trauma in a rural south Indian population: the Aravind Comprehensive Eye Survey. *Ophthalmology* 2004;111(9):1778–1781. [Google Scholar]
- Saunte J, Saunte M (2006) 33 cases of airsoft gun pellet ocular injuries in Copenhagen, Denmark, 1998–2002. *Acta Ophthalmol Scand* 84(6):755–758, doi:10.1111/j.1600-0420.2006.00734.x
- Dept. of Ophthalmology, Rumailah and Hamad General Hospitals, Hamad Medical Corporation, Qatar. abener@hmc.org.qa
- Ballal, S. (1997). Ocular trauma in an iron forging industry in the Eastern Province, Saudi Arabia. *Occupational Medicine*, 47(2), pp.77-80
- Cillino S., Casuccio A., Di Pace F. A five year retrospective study of the epidemiological characteristics and visual outcomes of patients hospitalized for ocular trauma in a Mediterranean area. *BMC Ophthalmol*. 2008;8:6. [PubMed] [Ref list]
- Jahangir T., Butt N.H., Hamza U. Pattern of presentation and factors leading to ocular trauma. *Pak J Ophthalmol*. 2011;27:96–102.
- Clinical pattern of pediatric ocular trauma in fast developing country. Al-Mahdi HS, Bener A, Hashim SP *Int Emerg Nurs*. 2011 Oct; 19(4):186-91. [PubMed] [Ref list]
- Al-Bdour MD, Azab MA. Childhood eye injury in North Jordan. *Int Ophthalmol*. 1998;22:269–73. doi: 10.1023/A:1006335522435. [PubMed] [Cross Ref]
- Aghadoost D, Fazel MR, Aghadoost HR. Pattern of pediatric ocular trauma in Kashan. *Arch Trauma Res*. 2012;1:35–7. doi: 10.5812/atr.5395. [PMC free article] [PubMed] [Cross Ref]
- Coody D, Banks JM, Yetman RJ, Musgrove K. Eye trauma in children: epidemiology, management, and prevention. *J Pediatr Health Care*. 1997;11:182–8. doi: 10.1016/S0891-5245(97)90125-5. [PubMed] [Cross Ref]
- Kaur A, Agrawal A. Pediatric ocular trauma. *Curr Sci*. 2005;89:43–6.
- tomazozoli L., renzi, G., mansoldo, C. 2003. Eye injuries in childhood: retrospective investigation of 88 case from 1988 to 2000. *Eur. J. Ophthalmol*. 13(8), 710_713.
- MacEwen CJBP, Desai P. Eye injuries in children: the current picture. *Br J Ophthalmol*. 1999;83:933–6. doi: 10.1136/bjo.83.8.933. [PMC free article] [PubMed] [Cross Ref]
- Strahlman E, Elman M, Daub E, Baker S. Causes of pediatric eye injuries. A population-based study. *Arch Ophthalmol*. 1990;108:603–6. doi: 10.1001/archophth.1990.01070060151066. [PubMed] [Cross Ref]

27. McGwin G, Hall TA, Xie A, Owsley C (2006) Trends in Eye Injury in the United States, 1992–2001. *Invest Ophthalmol Vis Sci* 47: 521–527 [PubMed]
28. Noorani S, Ahmed J, Shaikh A, et al. Frequency of different types of pediatric ocular trauma attending a tertiary care pediatric ophthalmology department. *Pak J Med Sci* 2010;26:567-570.
29. Rapoport I, Romem M, Kinek M, et al. Eye injuries in children 32 Philippine Academy of Ophthalmology in Israel: A nationwide collaborative study. *Arch Ophthalmol* 1990;108: 376-379.
30. Moriera CA Jr, Ribeiro MD, Belfort R Jr. Epidemiological study of eye injuries in Brazilian
31. Department of Ophthalmology and Visual Sciences. University of the Philippines-Philippine General Hospital Taft Avenue, Manila, Philippines
32. Fives,C.J., Kong, G., & Fuller,J.R.(2011). Anger, aggression, and irrational beliefs in adolescents. *Cognitive Therapy Research*,35:199-208.
33. Book, A.S., Starzyk, K.B., Qunisey, V.L. The relationship between testosterone and aggression (a meta-analysis). *Aggression and Violent Behavior*. 2001;6:579–599.
34. Curtis Craig (Department of Psychology, Texas Tech University, Lubbock, TX 79401, USA) Randy W. Overbeek (Department of Psychology, Texas Tech University, Lubbock, TX 79401, USA) Miles V. Condon (Department of Marketing, Texas Tech University, Lubbock, TX 79401, USA) Shannon B. Rinaldo (Department of Marketing, Texas Tech University, Lubbock, TX 79401, USA)
35. Podbielski DW, Surkont M, Tehrani NN, Ratnapalan S. Pediatric eye injuries in a Canadian emergency department. *Can J Ophthalmol*. 2009;44:519–22. doi: 10.3129/i09-093. [PubMed] [Cross Ref]
36. Cao H., Li L., Zhang M. Epidemiology of patients hospitalized for ocular trauma in the chaoshan region of China, 2001–2010. *PloS One*. 2012;7:e48377. [PubMed]
37. Ilsar M, Chirambo M, Belkin M. Ocular injuries in Malawi. *BrJ Ophthalmol* 1982;66:145-148.
38. Koval RK, Teller J, Belkin M, Romem M, Yanko L, Savir H. The Israeli Ocular Injuries Study. A nationwide collaborative study. *Arch Ophthalmol* 1988;106:776-780.
39. P Desai, C J MacEwen, P Baines, and D C Minassian Department of Public Health and Policy, London School of Hygiene and Tropical Medicine.
40. Salvi SM, Akhtar S, Curric Z. Aging changes in the eye. *Postgrad Med J* 2006;82(971):581-7.
41. Kuhn F, Morris F, Witherspoon CD, Mester V (2004) The Birmingham Eye Trauma Terminology system (BETT). *J Fr Ophthalmol* 27: 206–210 [PubMed]
42. Edfors, E., and Westergren, A. Home-Living Elderly People’s Views on Food and Meals. *Journal of aging research* 2012, 761291. [Google Scholar](#)
43. Northey Luke Cameron, Bhardwaf Gaurav, Curran Shane, McGirr Joseph. 2014 Eye trauma epidemiology in regional Australia. *Ophthalmic Epidemiology*, 21(4):237-246.
44. Department of Population and Health, University of Cape Coast, Private Mail Bag, University Post Office
45. Mehul A Shah, Shreya A Shah. Morphology of traumatic cataract: does it play a role in final visual outcome. *BMJ Open* 2011
46. . Lee J-S, Chiou M-J, Teng F-L, See L-C. The Role of Principal and Secondary Diagnoses of Hospitalized Eye Trauma: A Nationwide Cohort in Taiwan, 1996-2010. Huang L-M, ed. *PLoS ONE*. 2015;10(4):e0123348. doi:10.1371/journal.pone.0123348.
47. Ajayi BG, Osuntokun O. Perforating eye injuries in Ibadan. *West Afr J Med*. 1986;5:223–
48. Baiyeroju-Agbeja AM, Olurin-Aina OI. Penetrating eye injuries in children in Ibadan. *Afr J Med Med Sci*. 1998;27:13–5. [PubMed]
49. Sharma AK, Aslami AN, Srivastava JP, Iqbal J. Visual Outcome of Traumatic Cataract at a Tertiary Eye Care Centre in North India: A Prospective Study. *Journal of Clinical and Diagnostic Research: JCDR*. 2016;10(1):NC05-NC08. doi:10.7860/JCDR/2016/17216.7049.