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Original Article

PATTERN OF OCULAR TRAUMA IN KUCHING, MALAYSIA

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Conflict of interest: None

ABSTRACT
Objectives: To analyze the causes and characteristics of ocular injuries presenting to Sarawak General Hospital (SGH), Kuching.
Design: It is a prospective hospital-based study done for a period of 1 year.
Setting: Department of Ophthalmology, Sarawak General Hospital, Malaysia.
Participants: All ocular injury patients seen for the first time in the Eye Department during the period January 2006 to December 2006 were included in the study. Eye injury patients on follow-up and treated elsewhere were excluded.
Results: A total of 233 patients, and 257 eyes, were studied. Men had six-fold higher rates of injury than women. The average age of presentation was 30 years. The predominant age group was between 21-30 years, 26.2 % (n=61). Eye injuries related to work were seen in 36.9% of patients. There was a gross negligence in the use of personal protective devices in the work-related group. The common settings in which the injuries occurred included home 34.3% (n=80) and industrial premises 31.8% (n=74). Assault-related injuries 7.7% (n=18) were seen mostly among young men in the age between 20-30 years. The initial presenting visual acuity of the patients with blunt ocular trauma was better than penetrating injury.
Conclusion: Ocular injuries were common in young males. Work related eye injuries were noted in a significant number of cases. Health education and preventive strategies both in the working place and at home will help to decrease the occurrence of ocular injuries.
Keywords: Ocular trauma, eye injury, prevention, diagnosis, epidemiology
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INTRODUCTION

Ocular injuries still remain a significant global health problem. The epidemiological data for ocular injuries are scarce or totally lacking unlike other major blinding conditions such as cataract, trachoma, xerophthalmia, where epidemiological studies have contributed much.[1] It has been recognized that ocular trauma is a leading cause of monocular blindness.[2] The annual incidence of ocular trauma is 55 million, of which 750,000 cases require hospitalization each year, including some 200,000 open globe injuries.[3] Ocular trauma is one of the preventable causes of visual impairment.[4]

In Malaysia, Study from the National Health and Morbidity Survey II in 1996, revealed that the national prevalence of blindness is 0.29% and the prevalence of low vision is 2.44%.[5] Cataract remains the single largest cause of blindness in the country (39.1%), followed by retinal diseases (24.5%) and uncorrected refractive error (4.1%).[6] Sarawak, the largest state in Malaysia, has a higher number of blind people, approximately 0.33% of the population.[7] The incidence of ocular trauma is under-reported in Malaysia, and not many studies have been done on ocular trauma. This study was undertaken to gather information on the epidemiology of ocular injuries in East Malaysia. This study can also provide some references to the future researchers who want to do more research on ocular trauma in this part of the country.

METHODS

This was a prospective study done over a period of 12 months (January 2006 to December 2006), at the Ophthalmology Department of Sarawak General Hospital, Kuching. All ocular injuries patients seen in the Ophthalmology Department for

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the first time were included in this study. Patients treated elsewhere and patients on follow-up were excluded from the study. The demographic details and details about the ocular injury were entered into a specially designed proforma, based on the US Trauma Registry questionnaire.[8] Patients with severe form of ocular trauma were hospitalized and others treated as outpatients. The demographic details included name, age, gender, and ethnicity. The details about injury included the date of injury, eye affected, place, intent, source and type of injury. All ocular injuries were divided into either work related or non- work related. The nature of occupation and the use of personal protective devices were elicited in the work-related group.

The different ethnic groups were divided into categories 1-5, which included Iban, Bidayuh, Malays, Chinese and others. Age group was stratified into 10-year intervals. Place of occurrence of the injury were classified as follows: Industrial premises (any injury related to work), home, sports-related, street, public building and others. Type of the injury was classified under the following: unintentional, assault, self-inflicted and abuse (child, spouse, elder, unknown). Alcohol or drug abuse leading to ocular injury was noted. The source of ocular injury was classified as follows: sharp object, blunt object, fall, motor-vehicle accidents, fireworks, burns and eye injuries related to superficial foreign bodies were put under miscellaneous groups. The preliminary data entry was followed by detailed eye examination. Tissues involved were documented and any previous ocular abnormality was also recorded. Visual acuity was categorized as follows: 6/6 to 6/9, 6/12 to 6/36, 6/60 to CFCF (counting finger close to the face), HM (hand movement), and PL (perception of light) and NPL (no perception of light). Ocular injuries associated with other organ injury were also noted.

RESULTS

Our study involved 257 eye injuries in 233 patients. Of these 233 patients 46.8% (n=109) required outpatient management whereas 53.2% (n=124) of them needed hospitalization due to the severe nature of the ocular injury. Out of 233 patients, 85.8% (n=200) of them were males and only 14.2% (n=33) were females. The male to female ratio was 6:1. Right eye was involved in 46.4% (n=108), the left eye was involved in 43.3% (n=101) and bilateral involvement was seen in 10.3% (n=24) of the patients.

Sarawak state is a multi-racial community having nearly 29 different ethnic groups. The percentage distribution of these different ethnic groups in Sarawak is as follows: Iban 28.9%, Chinese 25.5%, Malay 22.2%. Bidayuh 8%, other indigenous population 5.7%, Melanau 5.5%, and Others 4.1%. Ocular injury was commonly noticed in Malays (32.2 %) followed by Chinese, (25.3%).

The age distribution of the patients is shown in (Table:1). The average age was 30 years, with a range of 1-72 years. Injuries were more frequent in the 21-30 years group and 41-50 year group.

Table 1. Distribution of eye injuries according to age group

Age group (Years)	No of patients (frequency)	Percentage (%)
<10	33	14.1
11-20	33	14.1
21-30	61	26.1
31-40	41	17.5
41-50	44	18.8
51-60	12	5.1
>60	9	3.8
Total	**233**	**100**

In our study 36.9% (n=86) of ocular injuries were work-related and 63.1% (n = 147) were not work-related. The type of work associated with injury is shown in (Table: 2)

Table 2. Occupations of patients with eye injuries

Occupation	Number (%)
Labourer	38 (44.2)
Mechanic	19 (22.1)
Welder	8 (9.3)
Construction worker	5 (5.8)
Farmer	4 (4.7)
General worker	4 (4.7)
Self-employed	3 (3.5)
Other occupations*	5 (5.8)
Total	**86**

*Include one each of the following: teacher, carpenter, crane Operator, land surveyor, driver

The different settings in which ocular injuries occurred are shown in (Table:3). The commonest location for eye injury to occur was in the home 34.3% (n=80) and industrial premises 31.8% (n=74).Injuries at school were uncommon (1.7%).

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Table.3 Location of patients at the time of eye injury

Place of injury	No of patients (frequency)	Percentage (%)
Industrial premesis	74	31.7
Farm	6	2.5
Home	80	34.3
School	4	1.7
Sports and recreation centres	11	4.7
Street and highway	50	21.4
Public building	5	2.14
Others	2	0.85
Unknown	1	0.42
Total	**233**	**100**

In our series most of the patients had sustained eye injuries accidentally 92.3 %(n=215), however, 7.7% (n=18) of them sustained injuries as a result of assault. Ocular injuries in young males (20-30 years) were significantly more work-related 61% (n=33) and more assault-related 38.8% (n=7) (p = 0.01). Alcohol-related ocular injuries 6.9% (n=16) were more observed in motor-vehicle accidents.

The different modes of ocular injury in this study is shown in (Table: 4). The commonest source of injury were from blunt objects 30% (n=70) and sharp objects 23.2% (n=54).

Table. 4 Mode of eye injury

Source	Number (%)
Sharp object	54 (23.2)
Nail	15 (6.4)
Fall	11 (4.7)
Blunt object	70 (30.0)
Gunshot	2 (0.9)
Motor vehicle accident	28 (12)
Firework	2 (0.9)
Burns	14 (6.0)
Explosion	5 (2.1)
Unknown	1 (0.4)
Others	31 (13.3)
Total	**233**

In patients with severe ocular trauma, the initial presenting visual acuity was better in patients with contusion injuries (closed globe injury) than penetrating injuries (open globe injury). Visual acuity in patients with contusion injury and penetrating injury at presentation and after follow-up is given in (Table: 5). Visual acuity of patients better than 6/60 in contusion injuries was 70.1% (n=80) and in penetrating injury 37.25% (n=19). Follow-up visual acuity at 3 months duration showed 73.68% (n=84) and 43.13% (n=22) cases in the contusion and penetrating injury group was better than 6/60. Long term follow-up of these patients was not possible as most of the referred patients were asked to follow in the respective hospitals.

Table 5. Visual acuity at initial presentation and at 3 months follow-up

Visual acuity	Contusion		Penetrating injury	
	Initial presentation	3-month follow-up	Initial presentation	3-month follow-up
6/6 to 6/9	39	61	9	11
6/12 to 6/36	41	23	10	11
6/60 to CFCF	11	14	11	12
HM	17	12	11	8
PL	3	1	4	3
NPL	3	3	6	6
Total cases	114	114	51	51

In our series the anterior segment was involved more 79.3% (n=185) than the posterior segment 12% (n=28), however lids and adnexal structures were involved in 8.5% (n=20) of the patients.

We adopted the Birmingham's Eye Trauma Terminology classification [9] to categorize our patients with severe eye injury, however patients with superficial corneal foreign body and ocular burns were grouped separately (figure 1).We had 23 patients with superficial corneal foreign bodies and 18 patients with ocular burns (chemical and thermal injury). In patients with severe ocular trauma, contusions were the commonest closed globe injury (n=114) and penetrating injuries were the commonest open globe injury (n=51) seen. In the polytrauma group 13 patients out of 17 had injury involving the face, whereas 4 patients had associated limb fractures.

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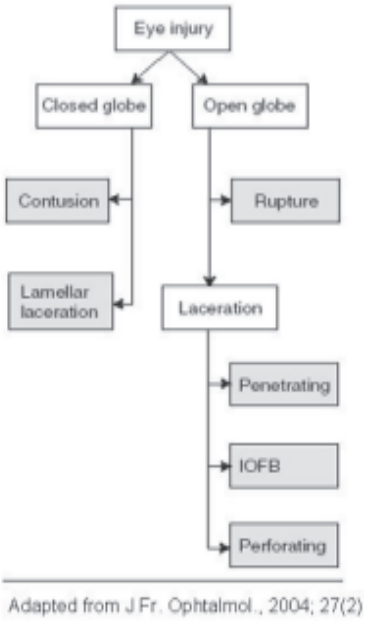
Figure 1. The Birmingham Eye Trauma Terminology System (BETT) for severe ocular trauma



DISCUSSION

The incidence of ocular injuries is more in developing countries than in developed countries. In developed countries the incidence seems to be higher in industrialized areas than non-industrialized areas. Zander & Giessler[10] first reported the incidence of ocular injuries in (1864), as 1.8 to 9%. Desai *et al*[11] in a prospective study involving 415 patients reported the incidence to be 8.14%. Wong *et al*[12] in a population-based study in Singapore reported the incidence as 12.6%. However the annual incidence rates (per 100,000 populations per year) for eye injury patients are: 13.2 (Sweden) [(13)]; 15.2 (United States);[14] our study involved 233 patients and 257 eyes. We could not report the incidence of ocular injuries in our study, as our sample size was small and it was a hospital-based study and not a population-based study.

Many hospital and population based studies indicate a large preponderance of injuries affecting males,[15] approximately 70 to 85%.[16] The greater tendency for men to sustain eye injury is multifactor which includes aggressive behaviour, work-related, sports related, assault related, alcohol and drug abuse and reluctance to use protective devices at work. In our study also, men were more involved in ocular injuries 85.8% (n=200) than women, a ratio of 6:1.

The age of occurrence of ocular trauma is bi-modal, with the maximum incidence occurring in young adults and a second peak in elderly.[17] The cause for high incidence of ocular injuries in young adult males has already been highlighted. The increase incidence of ocular injuries among elderly could be because of poor vision as a result of various ocular conditions like cataract, glaucoma, age related macular degeneration and previous ocular surgeries. Schrader [(18)] reported that the incidence of open globe injuries in Germany was high in the elderly during early 1990's, which he attributed to an increase rate of cataract surgeries performed during that year. Wong and Tielsch[12] have shown bi-modal age pattern of ocular injury in a population-based study in Singapore. Our study did not show a bi-modal pattern, which could be due to small sample size, but showed a predominant involvement of young males. In our series ocular injuries were common in the age group of 21-30 years, followed by 41-50 years. Shukla *et al*[19] in their prospective study involving 400 patients has shown that the commonest age group of people involved was in the third decade. A study done in Baluchistan by Qureshi[20] also showed similar age group involvement (21-30 years).

Malays were the predominant ethnic group indulged in ocular injuries 32.2% (n=75) in our study followed by Chinese 25.3% (n=59). Wagener *et al*[21] also reported racial differences in ocular injuries; they have shown that working blacks had fewer ocular injuries than working whites. Wong *et al*[12] reports that the risk of ocular injuries were twice in Indian men than Chinese or Malay men in Singapore.

Bilateral involvement of the eyes usually occurs in severe form of ocular trauma, which is often associated with polytrauma. Bilateral eye injuries are usually the result of bomb blasts, anti-personal mines and motor vehicle accidents. Karaman *et al*[22] has given figures of 3.7% for bilateral trauma and Khan *et al*[23] in a 12 years review of ocular trauma has given figure of bilateral trauma as 4.9%. We had 10.3% (n=24) patients with bilateral ocular involvement. Both eyes were involved mainly in patients with chemical injuries.

Work related injuries occurred in 36.9 % (n=86) of patients. The common occupations among these groups were mechanics, welders, labourers and general workers who were involved in high-powered tools activities like hammering, grinding, welding and cutting metals. None of these patients gave history of wearing protective devices while working. Though there was a high risk of ocular injury in these occupations, the use of personal protective devices was totally absent in this group. Legislation to use protective eye devices is implicated only in the major industries, whereas in small scale industries it is totally ignored. These small industries should be brought under strict legislation to implement protective eye wear. The preventive strategies should also be more focused on these areas to reduce the incidence of ocular injuries.

The causes of ocular trauma have changed continuously over the course of this century in the UK.[24] Almost 100 years ago, more than 70% of all serious ocular injury occurred in the work place. In 1960-1970 motor vehicle accidents, predominated the cause. Sports injury dominated in 1980's, and now home

has been recognized as the common location for ocular injury. This fact is further supported by the study done by Desai et al[11] who showed that home is the frequent place of ocular injury in his study. The most common settings in which injury occurred in our series were home 34.3 % (n=80), followed by work place 31.8 % (n=74), street and highway 21.5 % (n=50). Accidents are preventable and they occur as a result of ignorance, haste, negligence, carelessness and lack of knowledge. Our series shows similar findings. Ninety-two percent (n=215) of ocular injuries were accidental and 7.7 % (n=18) were due to assault.

There was evidence of definite or possible alcohol use in 6.9 %(n=16) of the injured persons. Almost all the alcohol-related injuries were associated with motor vehicle accidents. Sports-related injuries were seen in 2.5% (n=6) patients. Blunt trauma with shuttlecock was the predominant sports injury noted in our study and we had one patient with rugby related ocular injury.

Serious eye injuries involving the orbit and intra-ocular structures are usually classified into those caused by blunt objects, large sharp objects, small flying particles and burns.[24] The common causes of ocular injuries in our study were blunt objects 30 % (n=70) followed by sharp objects 23.2 % (n=54).

Visual loss following ocular injury depends on the type of injury, mechanism and extent of damage sustained by the eye and the use of any protective devices. Penetrating injuries carry a poorer prognosis than contusion injuries. In our series 26.4% (n=68) had mild to moderate visual impairment (visual acuity 6/12 to 6/36) and 34.2% (n=88) suffered severe visual loss (vision 6/60 and worse). The initial visual loss was more in penetrating than contusion injuries.

Karaman *et al*[22] in their retrospective analyses of 383 patients found 67.3% of ocular injuries were closed globe and 32.7% were open globe injuries. MacDonald[25] found perforating injuries in 51.6% and contusions in 41.7% patients in study. In our analysis closed globe injuries were 125 cases (61.1%) and open-globe injuries were 67 cases (34.8%).

Chemical injuries were seen in 17 patients in our study. Acid injuries were more common than alkaline injuries, and mostly due to automobile battery explosion. Intraocular foreign body constituted 11 cases and globe rupture occurred in five cases. Motor vehicle accidents were the common mode of injury in patients with globe rupture.

Majority of ocular injury cases occur in isolation and are associated with injuries of other organs only in sever ocular trauma, especially if it is due to motor vehicle accidents. Ocular injuries are usually not given priority if it is accompanied with multiple system injuries. After identifying major organ injury and stabilizing the general condition of the patient, ocular injuries should be given preference to simple fractures, because visual loss can be a great morbidity for the patient once he recovers from the minor ailment if the ocular condition is neglected. Facial injuries may be associated with severe ocular trauma. In our study we had 7.3% cases (n=17) with injuries elsewhere in the body, but majority of the cases 92.3 % (n=216) were isolated ocular injuries.

CONCLUSION

Contusion injuries were common in young males. Home and industrial premises were the common location of ocular injuries. Public awareness and strict legislation to use personal protective devices can help to reduce the occurrence of ocular injury. Our study can be an eye opener for any further study in the field of ocular injuries in this part of the world.

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Evaluating Tai Chi

Lee MS, Pittler MH, Ernst E. Tai chi for osteoarthritis: a systematic review. *Clin Rheumatol.* 2008;27(2):211-8.
This is a systematic review of 12 clinical trials (5 RCTs, 7 non-randomised clinical trials). It concluded: "there is some encouraging evidence suggesting that tai chi may be effective for pain control in patients with knee OA. However, the evidence is not convincing for pain reduction or improvement of physical function."

Lee MS, Pittler MH, Shin BC, Ernst E. Tai chi for osteoporosis: a systematic review. *Osteoporos* Int. 2008; 19(2):139-46.
This is a systematic review of 7 clinical trials (5 RCTs, 2 non-randomised clinical trials). It concluded: "The evidence for tai chi in the prevention or treatment of osteoporosis is not convincing."

Low S, Ang LW, Goh KS, Chew SK. A systematic review of the effectiveness of Tai Chi on fall reduction among the elderly. Arch Gerontol Geriatr 2008.
This is a systematic review of 7 clinical trials. It concluded: "Tai Chi has the potential to reduce falls or risk of falls among the elderly, provided that they are relatively young and non-frail."

Yeh GY, Wang C, Wayne PM, Phillips RS. The effect of tai chi exercise on blood pressure: a systematic review. *Prev Cardiol.* 2008;11(2):82-9.
This is a systematic review of 26 studies (9 RCTs, 13 non-randomised clinical trials, 4 observational studies). Study heterogeneity precluded formal meta-analyses. Tai chi exercise may reduce BP and serve as a practical, nonpharmacologic adjunct to conventional hypertension management