Original article

Pattern of ocular trauma seen in Grarbet Hospital, Butajira, Central Ethiopia

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Abstract

Background: Ocular injury is one of the major causes of monocular visual impairment and blindness worldwide, with significant socioeconomic impact.

Objective: To evaluate the epidemiology and outcome of ocular trauma cases presented to Grarbet Hospital in central Ethiopia over a one year period.

Methods: This is a prospective hospital-based study in Grarbet Hospital from November 2009 to October 2010. All patients with ocular injuries seen in the eye unit for the first time were included in the study. Data on demography, initial and final visual acuities, type of injury as well as management were included in a structured questionnaire. The collected data were processed and analyzed using SPSS for Windows version 12.

Result: The study involved 764 eye injuries in 753 patients, about 5% of all new patients seen during the study period at the hospital. The majority of the patients 75% (n=566) were males. The male to female ratio was 3:1. The left eye was involved in 51% (n=386) of the patients. The average age was 27 years, with a range of 5 months to 82 years. The injuries were more frequent in the 15-30 year age group followed by those in the age group of less than 15 years. Over half (57.2%) of the patients had to travel over 21 kilometers to get ophthalmic assistance. When the type of injury was analyzed, the rate of Visual Acuity $\leq$ 6/60; 39.1% among those with penetrating trauma (p = *0.017*), 29.5% among those with contusion (*p = 0.023*) and 5.4% among those with intraocular foreign body (IOFB) injury (p = 0.98). The commonest source of injury were from blunt objects 40% (n=302) and sharp objects 33% (n=250).

Conclusion: Ocular injury is still a common and avoidable cause of blindness. The study shows a clear need for primary prevention and control measures. [*Ethiop. J. Health Dev.* 2011;25(2):150-155]

Introduction

Ocular trauma is a common cause of monocular visual impairment and blindness worldwide, with significant socioeconomic impact (1). Each year, there are 55 million eye injuries globally that result in restrictive activities for more than a day. About 19 million have at least unilateral permanent reduction in vision and 1.6 million people are blinded by their injuries (2).

Eye injuries are the most common causes of monocular blindness in Ethiopia. A study on the pattern of ocular injuries at Menelik II hospital revealed that 15.8% of blindness to be attributed to trauma alone (3-5). The age distribution for serious ocular trauma is bi-modal, with the maximum incidence in young adults and second most in the elderly. Both hospital and population-based studies indicate a large preponderance of injuries affecting males (3, 6-8). Various studies show that there is significant difference from workplace to home as the likely place of eye injury (9, 10). Study in Ghana showed ocular injuries constituting 6.2% of all admissions in the eye unit (6). Sticks are the most common cause of ocular injury in rural Ethiopia and Ghana (6, 11, 12). Hospital based study done in Ethiopia showed the majority of ocular injuries are minor, affecting the peri-orbital structures or the ocular surface such as superficial corneal damage by foreign bodies or corneal abrasions (11).

In addition to the impact on the affected individual, there are profound social implications regarding the lost productivity by young men and the requirement of caring facilities and rehabilitation for the elderly. Therefore, knowledge of the causes of ocular trauma is essential for proper management of patients and future prevention of the injury. The etiology of ocular injury differs among populations. Previous studies have shown that socioeconomic status, education and cultural habits play an important role both in the occurrence and in the outcome of ocular injury (13-15).

This study aimed at providing epidemiologic data on ocular injuries in Grarbet Hospital, to help in the planning and provision of eye care and safety strategies in the region. It is believed that the results of the study would shade light on the causes of the ocular injuries and the preventive measures that are to be taken to reduce the injuries.

Methods

This is a prospective hospital-based study that was conducted in Grarbet Tehadiso Mahber secondary eye care center situated in Butajira, Gurage Zone of the Southern Nations, Nationalities and Peoples Regional State (SNNPR). Butajira town is 133 km south of Addis Ababa, the Ethiopian capital. The eye care center was recently upgraded to an eye hospital. The non-governmental organization, Grarbet Tehadiso Mahber was established in the town of Butajira in 1995 with generous assistance from the Swedish Vassttenbotten Association for the Neurologically Disabled (VAND), Swedish Organization of Disabled International Aid Association (SHIA) and the Ethiopian government. The

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eye hospital serves a population of about 1.5 million residing in six woredas (sub-districts) of the Silti and Gurage zones of SNNPR. It is the only secondary eye center in the area. The hospital provides a range of medical services for ocular trauma cases. Medical facilities include an emergency room, an out-patient and in-patient departments, operation rooms, a fully equipped laboratory and a well stocked pharmacy.

The study took place from November 2009 to October 2010. All consecutive patients with ocular injuries seen in the eye unit for the first time were included in the survey. Patients treated elsewhere or on follow-up were excluded from the study. Data on demographic information, distance traveled by patients to obtain treatment, time interval between the injury and presentation for treatment, eye affected, initial and final visual acuities (VA) were recorded. The source and type of injury and management were also included in the structured questionnaire that was used to collect the necessary data. This was designed based on the US Trauma Registry questionnaire (16). 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 questionnaire for the work-related group.

Patients' age was stratified into four age groups. Places of occurrence of the injury were classified as industrial premises, farm, home, school, public building, recreational facilities, during sport activities and on the road or highway. If a patient did not know the place where the injury occurred, it was recorded as unknown. The type of the injury was classified under unintentional, self-inflicted, assault or injury by another person and unknown. Alcohol or drug abuse leading to ocular injury was recorded. Ocular injuries associated with other organ injury were also noted.

The source of ocular injury was classified as: tools/metals, sharp object, nail, blunt object, tree leaves, a fall, traffic accident, fireworks, burns and chemicals. Tissues involved and any previous ocular abnormalities were also documented. Visual acuity was measured initially at first arrival and finally at the end of follow-up (1 week to 2 months), and was categorized as 6/6 to 6/9, 6/12 to 6/36, 6/60 to CFCF (counting finger close to the face), HM (hand movement), PL (perception of light) and NPL (no perception of light).

The type of injury was classified according to Birmingham's Eye Trauma Terminology classification (BETTS) (17) as closed globe injuries for contusions, lamellar lacerations and superficial foreign body while ruptures, penetrating, perforating and intraocular foreign body laceration as open globe injury. An ocular burn was taken separately. Patients, who were managed on medications only, were grouped as being managed conservatively while those that required additional interventions had the specific procedures recorded.

Statistical analysis was performed with Statistical Package for the Social Sciences (SPSS) version 12. A P value of <0.05 was accepted as indicative of statistical significance. The study did obtain that required ethical approval from Grarbet Tehadiso Mahber head office.

Results

The study involved 764 eye injuries in 753 patients, of these patients 75% (n=566) were males and 25% (n=187) females. The male to female ratio was 3:1. The patients with ocular injury formed 5% of all new patients seen in the eye unit during the study period. The left eye was involved in 51.3% (n=386), the right eye was involved in 47.2% (n=356) and bilateral involvement was seen in 1.5% (n=11) of the patients. The average age was 27 years, with a range of 5 months to 82 years. Only 7.7% (n=58) of the patients were bystanders. Injuries were more frequent in the 15-30 years followed by less than 15 year groups (Figure 1). Injuries were less frequent in March, April and May and more frequent in June, July and September.

There was a significant association between the place where the injury occurred and age group ($P<0.001$). Home, farm, street and highway were found to be the most common places for all age groups: 616 (81.8%) (Table 1). Of the 529 patients above 16 years (working population), 320 (60.5%) had the trauma at work (commonly farm area).

It was found that 44.4 % (334) of the patients were from immediate surroundings (< 20km), while 55.6 % (419) had to travel from 21 to over 100 km in search of ophthalmic assistance. When the time interval between occurrence of injury and presentation was compared, 171 (23.5%) and 65 (8.9%) patients were present on the first and second day after the initial injury respectively (Table 2). Most (67.6%) patients were present on the third day and later; while 26 patients did not know the occurrence of injury (the majority of these patients were present with superficial foreign body). During the study period, most (77.6%) of the patients had sustained eye injuries accidentally. However, 18.1% (n=136) sustained injuries as a result of assault. Ocular injuries in young males (15-30 years) were significantly ($p<0.01$) more work-related (69.3%), assault-related (21.9%). Alcohol-related ocular injuries were 2.1%.

The commonest source of injury were from blunt objects 40% (n=302) and sharp objects 33% (n=250) (Table 3). Etiologically, a wide range of objects were involved. These included sticks, pieces of wood, animal horn, burst of sand and gravels among the farmers. Among the school children, the above-listed objects were implicated in addition to injuries from pencils and thrown objects.

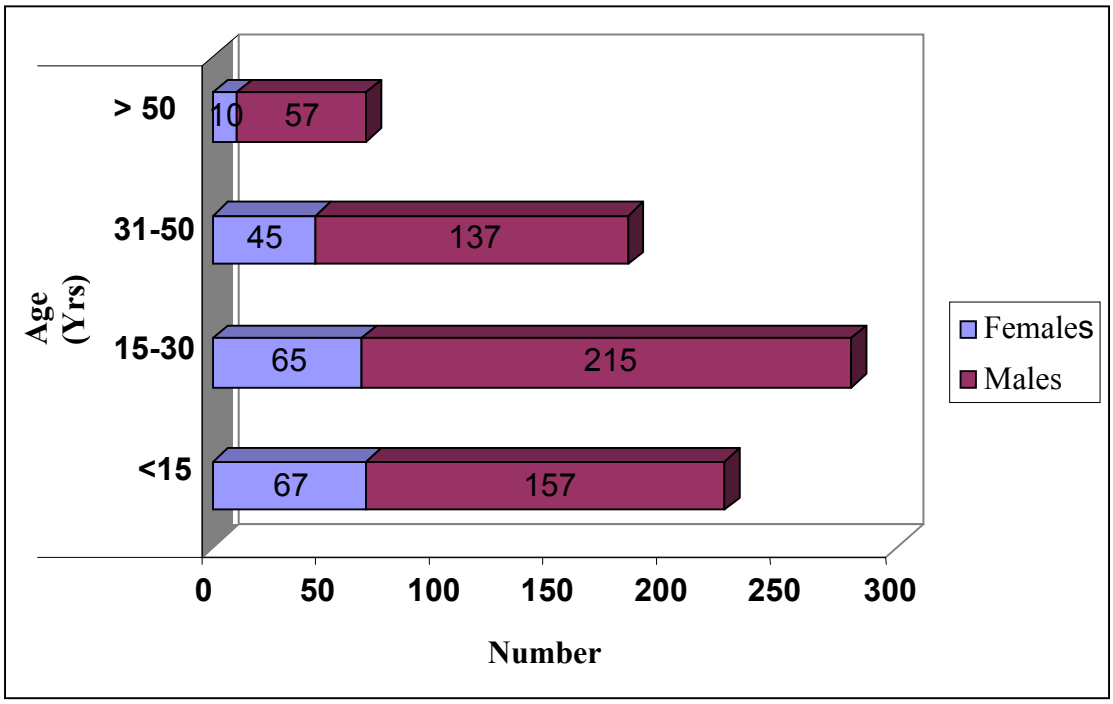

Figure 1: **The distribution of patients according to age groups and gender, Grarbet Hospital, Nov. 2009-Oct. 2010.**

Table 1: **Relation between place where the injury occurred and age, Grarbet Hospital, Nov. 2009-Oct 2010.**

Place	Age				Total
	< 15 yrs	15-30	31-50	> 50	
Home	111 (37.1%)	99 (33.1%)	64 (21.4%)	25 (8.4%)	299 (39.7%)
Farm	39 (18.5%)	70 (33.2%)	69 (32.7%)	33 (15.6%)	211 (28%)
Street and Highway	24 (22.7%)	47 (44.3%)	30 (28.3%)	5 (4.7%)	106 (14.1%)
Industrial premise	3 (7.7%)	28 (71.8%)	8 (20.5%)	-	39 (5.2%)
School	22 (62.9%)	12 (34.3%)	1 (2.8%)	-	35 (4.6%)
Place for recreation & sport	11 (61.1%)	7 (38.9%)	-	-	18 (2.4%)
Public building	3 (16.7%)	11 (61.1%)	4 (22.2%)	-	18 (2.4%)
Unknown	11 (40.8%)	6 (22.2%)	6 (22.2%)	4 (14.8%)	27 (3.6%)
Total	224 (29.7%)	280 (37.2%)	182 (24.2%)	67 (8.9%)	753 (100%)

Table 2: **Relation between distance and time of presentation, Grarbet Hospital, Nov. 2009-Oct. 2010.**

Distance traveled	Time of presentation					Total
	Within 24 hrs	Within 48 hrs	Within 1 wk	After 1 wk	Unknown	
<20 km	106	30	105	82	11	334
21-100 km	51	30	98	123	13	315
>100 km	14	5	23	60	2	104
Total	171	65	226	265	26	753

Of the 753 patients who had ocular injury, 349 (46.3%) sustained workplace-related ocular trauma. Similarly, 226 (64.7%) of 349 patients were farmers, welders and construction workers accounting for 26 (7.4%) and 24 (6.9%), respectively. Eighteen (5.2%) patients were self-employed, 14 (4.1%) worked in general work occupations. Daily laborers and mechanics each accounted for 5 (1.4%) and 4 (1.1%) respectively. Thirty two (9.2%) patients were involved in other occupations.

The initial visual acuity was measured for 687 patients and out of this visual acuity was $\leq$ 6/60 in 273 (39.7%) patients of whom 220 (80.5%) gained similar visual acuity during follow up. The final visual acuity measured for 679 patients (90.2%) was $\leq$ 6/60 in 220 (32.4%). When the type of injury was analyzed, the rate of VA $\leq$ 6/60 was 86 (39.1%) among those with penetrating trauma ($p = 0.017$), 68 (30.9%) among those with contusion ($p = 0.023$) and 12 (5.4%) among those with intraocular foreign body (IOFB) injury ($p = 0.98$) (Table 4). Out of 687 patients, 112 (16.3%) of the patients had VA $\leq$ 6/60 before the injury because to other ocular diseases like cataract, age related macular degeneration, refractive error and corneal opacity.

Table 3: **Types and causes of ocular injuries, Grarbet Hospital, Nov. 2009-Oct. 2010.**

Types of ocular injuries	Sources/ Causes											
	Tools/ metal	Sharp object	Blunt object	Fall	Tree leaves	Traffic accident	Fire Works	Burn	Lawn equipment	Chemical	Unknown	Other
Contusion	-	-	221	5	4	4	-	-	-	-	-	6
Superficial FB	62	10	19	-	23	-	-	-	-	-	-	2
Adnexal Injuries	1	58	20	5	6	3	1	1	-	-	1	3
Corneal Burn	-	-	-	-	-	-	2	1	-	18	-	-
Partial thickness wound	8	30	36	2	12	-	-	2	1	-	2	-
Rupture	-	1	6	-	-	-	-	-	-	-	-	-
Penetration	4	136	-	2	1	-	-	-	-	-	3	5
Perforating	2	2	-	-	-	-	-	-	-	-	-	-
IOFB	9	13	-	-	-	-	-	-	-	-	-	-
Total	86	250	302	14	46	7	3	4	1	18	6	16

Table 4: **Final visual acuity by type and anatomic location of injury, Grarbet Hospital Nov. 2009-Oct. 2010.**

	NLP	LP	HM	6/60-CF	6/12-6/36	6/6-6/9	Total No of patients (%)
Contusion	16	14	4	34	25	134	227 (33.4)
Superficial FB (Conjunctival/Corneal)					4	110	114(16.8)
Laceration							
Adenxal	4	5	2	6	11	45	73 (10.7)
Lacrimal	1	-	-	1	1	4	7 (1.0)
Adenxal and lacrimal	-	-	-	1	1	2	4 (0.6)
Corneal burn	3	-	-	-	-	17	20 (1.9)
Partial thickness wound	2	2	3	13	15	53	88 (13.0)
Rupture	6	1	-	-	-	-	7 (1.1)
Penetration							
Corneal	14	14	8	30	22	3	91 (13.4)
Seleral	9	1	1	3	1	1	16 (2.3)
Coneoscleral	3	1	1	1			6 (0.9)
Perforating	3	1	-	-	-	-	4 (0.6)
IOFB	1		2	9	8	2	22 (3.3)
Total	62 (9.1%)	39 (5.7%)	21 (3.1%)	98 (14.4%)	88 (12.9%)	371 (54.6%)	679 (100)

Five hundred three (66.8%) patients were managed conservatively on medications only while the remaining 250 (33.2%) required additional procedures. Superficial and deep corneal foreign body removal for 135 (17.9%) patients, ocular wall repair for 40 (5.3%) patients, ocular wall repair with cataract extraction for 6 (0.8%) patients, eyelid and lacrimal wound repair for 20 (2.6%) and cataract extraction for 42 (5.6%) patients were the most commonly required additional procedures in ocular trauma among the study group. Four (0.53%) of the patients with ocular trauma required enucleation; one had evisceration following severe and uncontrolled endophthalmitis while in three patients enucleation was carried out for very severe injury. Three cases required globe exploration.

Discussion

The incidence of ocular injuries is more in developing countries and it consists of largely a preventable cause of monocular visual impairment and blindness. Hospital-based studies show that 5% to 16% of all ophthalmic admissions to eye hospitals/units are related to ocular injuries (2). The incidence of 5.2% found in our study is consistent with these previous reports. The propensity towards young males and school-going children was again consistent with those identified in this study. The results of 75% male and 66.9% aged below 30 years, respectively, parallel the trends reported by other authors (18, 19). The result with the majority of cases involving young and working groups shows that the socio-economic load of injury on the communities involved in this study.

Thompson et al. reported that most injuries in the pediatric population took place at home (20). Most of the studies indicate that the home as the most common place of ocular injury (1). Similar to the study done in Malawi (21), in this study ocular injury at home, mostly by forks, sticks or knives, still account for a high percentage of injuries, especially in the pediatric population.

In most previous studies, work-related injuries were reported to be the commonest cause of eye injuries in adults (22, 23). This finding is supported by our study which shows that most of the injuries occurred related to work. As agriculture is the main source of income in the study area, 65% of the work related ocular injuries occurred during farming activities.

More than half of the patients had to travel over 20 km to reach an ophthalmic facility. This has very important implications for the development of eye care services. Most (67.5%) patients were present on the third day and later after the initial injury. Late presentation following ocular injury has been reported previously in a number of studies (24, 25). This study shows that there is a significant relationship between distance and time of presentation ($p<0.001$), this probably explains why 76.5% of the patients were present at least 24 hours after injury. This may be because the eye unit in question is the major referral center in the region.

In most studies, blunt objects, such as sticks or stones, were the main cause of eye trauma (9, 12, 26, 27). Similarly, the present findings concur with previous studies. A statistically significant relationship was also found between the place where the injury occurred and age group ($p<0.001$). Chemical injuries were seen in 18 patients in the study. Injuries caused by acids were more common than alkaline ones and occurred while performing farming activities and road construction work.

The majorities of ocular injury occurs in isolation and were not alcohol related. Only 3.7% and 2.1% of cases were associated with injuries of other organs and alcohol related respectively. Assaults were responsible for 18.1% of all injuries, and this is similar to the study done in the US (28) but higher than that in Malaysia (29). Many of these injuries took place during domestic violence.

The typical practice in managing ocular injuries is to restore the structural and functional integrity of the eye to its previous state as early as possible. This, of course, depends on the presence of the necessary human and technical resources. In our study all the open globe injuries occurred in older than 11 years old were repaired. But we referred 34 pediatric cases for ocular wall repair to other eye units because of that lack of an anesthetist in the eye unit.

Another finding was the seasonal variation, showing a steady rise from November (9.7%) with a peak in December (12.5%), then a gradual decline to April (6.6 %) and again rise going up to July (10.5%). During the summer, the most common occupation of the study group was farming. Hence, therefore, these eye injuries were related to the harvesting activities.

Initial visual acuity, type of injury, mechanism, and delay in presentation and extent of damage sustained by the eye were found to be important factors in outcome (18, 27). In this study, open globe injuries had better visual prognosis than closed globe ones. Out of 273 (39.7%) patients with initial VA $\leq$ 6/60 had remained the same on the follow-up period in 220 (80.5%) of cases**,** whereas 21.0 % of patients with 6/12-6/36 and 38.9% with 6/6-6/9 initial visual acuity had 12.9% and 54.6% during the follow-up period, respectively, which corresponds to the findings of previous reports (29-31).

Out of 142 subjects presenting themselves within first 24 hours and whose final vision was measured after injury 112 (78.8%) of the patients had gained final VA of more than 6/60 during follow up; whereas out of 507 subjects presenting themselves beyond first 24 hours and their final vision was tested after injury 328 (64.6%) gained a similar final VA ($P<0.001$). Therefore, delayed medical

and surgical intervention of ocular trauma cases often leads to poor final visual outcome.

In Conclusion, ocular injuries are still a common and preventable cause of monocular blindness. Community education is an essential part in prevention. Efforts to prevent ocular injuries should particularly be directed toward improving established domestic habits and taking care during farming and harvesting activities. The necessity of seeking professional medical help immediately after injury and the danger of delaying treatment should also be stressed. Adult supervision is an important factor in the prevention of eye injury in pediatric group.

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References

1. Negrel AD. Magnitude of eye injuries worldwide. Community Eye Health Journal 1997; 10(24):49-53.
2. Negrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiol 1998; 5(3):143-69.
3. Quanna P, Alemu B, Alemayehu W. Causes of blindness observed in the eye department of Addis Ababa university Hospital. Ethiop Med J 1986; 24:19-23.
4. Alemayehu W, Tekel-Haimanot R, Forsgren L, Erkstedt J. Causes of visual impairment in central Ethiopia. Ethiop Med J, 1995; 33:163-74.
5. Budden FH. Blindness in central Ethiopia. Geneva, WHO report 1981.
6. Gyasi ME, Amoaku WMK, Adjuik MA. Hospitalized ocular injuries. Ghana Medical Journal 2007;41(4):171-75.
7. Glynn RJ, Seddon JM, Berlin BM. The incidence of eye injuries in New England. Arch Ophthalmol 1988;106(6): 785-9.
8. Asaminew T, Gelaw Y, Alemseged F, Ethiopia Journal of Health Science 2009;19(2):67-74.
9. Tesyafe A, Bejiga A. Ocular injury in a rural Ethiopia community, East Afr Med J 2008; 85(12):593-6.
10. Khatry S, Lewis A, Schein O, Thapa M, Pradhan E, Khatz. The epidemiology of ocular trauma in rural Nepal Br J Ophthalmol 2004; 88:456-460.
11. Schrader W. Epidemiology of open globe injury analysis 1026 cases in 18 year. Klin Monastbl Augenheilk 2004; 221:629-635.
12. De Respinis PA, Caputo AR, Fiore PM, Wagner RS. A survey of severe eye injuries in children. Am J Dis Child 1989; 143:711–716.
13. Nelson LB, Wilson TW, Jeffers JB. Eye injuries in childhood: demography, etiology, and prevention. Pediatrics 1989; 84(3):438–441.
14. Soliman MM, Macky TA. Pattern of ocular trauma in Egypt. Graefes Arch Clin Exp Ophthalmol 2008; 246:205–212.
15. United States Eye Registry. Available from http://www.useironline.org/(accessed September 2009).
16. Kuhn F, Morris R, Witherspoon CD. Birmingham eye trauma terminology (BETT): Terminology and classification of mechanical eye injuries. Ophthalmol Clin North Am 2002;15(2):139-43.
17. Desai P, MacEwin CJ, Baines P, Minassian DC. Incidence of ocular trauma admitted to hospital and incidence of blinding outcome. Br J Ophthalmol 1996; 80:592-596.
18. Klopter J, Tielsch, JM, Vitale S, See LC, Canner JK. Ocular trauma in the United States. Arch Ophthalmol 1992;110:838-842.
19. Thompson CG, Kumar N, Billson FA, Martin F. The etiology of perforating ocular injuries in children. Br J Ophthalmol 2002; 86:920–922.
20. Ilsar M, Chirambo M, Belkin M. Ocular injuries in Malawi. Br J Ophthalmol 1982; 66:145 -148.
21. Schein OD, Hibberd PL, Shingleton BJ, Kunzweller T, Frambach DA, Seddon JM, Fontain NL, Vinger PF. The spectrum and burden of ocular injuries. Ophthalmol 1988; 95:300-305.
22. Nirmalan PK, Katz J, Tielsch JM, Robin AL, Thulasiraj RD, Krishnadas R, Ramakrishnan R. Ocular trauma in a rural south Indian population: Aravind Comprehensive Eye Survey. Ophthalmol 2004; 111:1778-1781.
23. Mackiewicz J, Machowicz-Matejko E, Salaga-Pylak M, Piecyk-Sidor M, Zagorski. Work-related penetrating eye injuries in rural environments. Ann Agric Environ Med 2005;12:27-29.
24. Nwosu SN. Domestic ocular and Adnexal injuries in Nigerians. West Afr J Med 1995; 14:137-140.
25. Rahman I, Maino A, Devadason D, Leatherbarrow B. Open globe injuries: factors predictive of poor outcome. Eye 2006; 20(12):1336–1341.
26. McCarty CA, Fu CL, Taylor HR. Epidemiology of ocular trauma in Australia. Ophthalmology 1999; 106:1847–1852.
27. Kuhn F, Morris R, Witherspoon D, Mann L**.** Epidemiology of blinding trauma in the United States. Eye Injury Registry, Ophthalmic Epidemiology 2006; 13:209-216.
28. Mallika PS, Tan AK, Asok T, Faisal HA, Aziz S, Intan G. Pattern of ocular trauma in Kuching, Malaysia. Malaysian Family Physician 2008; 3(3):140-145.
29. Sternberg PJ, Juan EJ, Michels RG, Auer C. Multivariate analysis of prognostic factors in penetrating ocular injuries. Am J Ophthalmol 1984; 98:467-472.
30. Smith D, Wrenn K, Stack L.B. The epidemiology and diagnosis of penetrating eye injuries. Acad Emerg Med 2002; 9(3):209-213.