ORIGINAL ARTICLE

Factors Responsible for Poor Visual Outcome Following Emergency Eye Surgery in a Tertiary Eye Centre

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ABSTRACT

BACKGROUND: *Ocular emergencies can cause permanent vision loss if they are not recognized and treated promptly. This study was carried out to identify the factors responsible for poor visual outcome following emergency eye surgeries.*
METHODS: *A cross-sectional study was carried out on all patients who had surgical emergency eye procedures. Clinic and theatre records of all eligible patients were retrieved. Demographic characteristics, duration of symptoms, laterality, presenting visual acuity, documentary pictures, classfication of eye injury, duration of days before surgery, surgical procedures performed and six weeks post-operative visual acuity were obtained from the records. Data were analyzed using Statistical Package for Social Sciences, version 25.*
RESULTS: *One hundred and ninety-four patients had emergency eye surgical procedures constituting 16.3% of all ocular emergencies. There were 145(74.7%) males and 49 (25.3%) females with a male-to-female ratio of 3:1. The proportion of students, 48(67.6%), that presented within 24 hours of injury was the highest while the civil servants, 8(17.8%), had the lowest proportion. Corneo-scleral repair topped the list of surgeries and was the commonest, 106(54.6%), procedure carried out the same day of presentation. A 3rd of the patients, 28(34.1%), who presented within 24 hours had normal vision 6 weeks post-operatively while over 4/5th of the patients who presented after 24 hours were blind six weeks post-operatively.*
CONCLUSION: *The prevalence of eye emergency surgical procedures was high with over 4/5th of these patients becoming blind six weeks post-operatively. Some of the factors responsible for poor visual outcome were delayed presentation, pre-operative visual acuity and delayed surgical intervention.*
KEYWORDS: Emergency, Eye, Procedures, Surgeries, Outcome

INTRODUCTION

Ocular emergencies could arise from various causes ranging from traumatic injuries, chemical injuries, inflammation to neovascular conditions (1). These should be managed in an established

ophthalmic emergency unit which is a cheap and efficient way to diagnose and care for such eye emergencies (2). However, the most common reason why patients visit eye-related emergency department is eye injury (3). The incidence of eye injuries requiring medical attention in New England was estimated to be 975 per 100,000 population which was twice the rate reported in Baltimore (4,5). Eye injury is a cause of monocular blindness worldwide (6) and most of these injuries are preventable with the appropriate use of protective eye wear (7). However, ocular emergencies can cause permanent vision loss if they are not recognized and treated promptly (8). Therefore, careful examination and appropriate surgical treatment are important factors in preventing poor visual prognosis in traumatic ocular emergencies (9). Various emergency eye surgical procedures are done for eye injuries (10). Some may have a single emergency operation while others undergo combined or repeated surgical procedures (9) and are difficult to manage with associated high risk of complications. They usually require prolonged hospital admissions for proper management (11). Unfortunately, despite the micro-surgical procedures available for the severely injured eyes, some eyes might still not be salvaged (12). Successful patient outcomes depend on prompt recognition as well as appropriate initial management and/or referral (13). Inadequate safety measures at work places, lack of adequate care facilities and delay in presentation have been reported as some of the inferred factors for poor outcome of some ocular emergencies in developing countries (13). The visual outcome despite advances in ophthalmic surgery has been reported to be disappointing (14). Primary enucleation may be considered for some of the eyes that cannot be salvaged (12). Therefore, this study was carried out to determine the prevalence of patients with eye emergencies that required surgical intervention.Not all ocular emergencies required surgical interventions Moreover, it was to find out some factors responsible for poor visual outcome in order to have a strategic plan to overcome the avoidable ones.

METHODS

Rsearch design: A cross-sectional study was conducted in a tertiary centre which is an urban hospital with established, strategically located tertiary eye care services. It runs subspecialty eye facility weekly in Glaucoma, Oculoplasty, Retina and General Ophthalmology.

Study subjects: All patients who had emergency surgical eye procedures were the subjects of the study.

Sample collection: Data was obtained from clinic and theatre records of all Ophthalmic Plastic patients who had emergency surgical eye procedures between January 2010 and December 2018. Demographic characteristics, main eye complaints, duration of symptoms, laterality, presenting visual acuity, documented relevant ocular findings following a detailed ocular examination both in the clinic and in the theatre after administration of anaesthetic agents, classification of eye injury, duration of days before surgery, documentary pictures of surgical procedures performed and six weeks post operative visual acuity were obtained from the records. Visual acuity was categorized with ≥ 6/18 as normal, <6/18 to >3/60 as visual impairment and <3/60 as blindness. Infants were classified as either blind or believed not to be blind.

Exclusion criteria: All patients who had emergency eye conditions but did not have surgical procedures were excluded from the study.

Ethical approval was obtained from the institution's ethical review committee though data collection did not directly involve patients' participation.

Data analysis: Data were analyzed using Statistical Package for Social Sciences (SPSS), version 25. Means (Standard deviations) were used to describe the distributions of continuous variables. Categorical variables were described in percentages. Comparisons of categorical data were performed with the use of Pearson's chi-square test. $P < 0.05$ was considered statistically significant.

RESULTS

One hundred and ninety-four (194) patients had emergency eye surgical procedures constituting

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16.3% of all ocular emergencies. The incidence of emergency eye surgical procedures performed during this period was 16.3% out of 1,188 ocular emergencies seen. There were 145(74.7.0%) males and 49(25.3%) females with a male-to-female ratio of 3:1 ($\chi 2$ =47.505, df=1, p=0.001) The ages ranged from 6 months to 87 years with mean age of 31.46 ±21.0 years. All the cases were unilateral with 103(53.1%) occurring in the right eye and 91 (46.9%) in the left eye.

Table 1 shows a consistently higher male than female proportions in all age groups. Students constituted over 1/3rd 71(36.6) of the patients who had emergency surgical procedures.

In Figure1, the proportion of students, 48(67.6%), that presented within 24 hours of injury was the highest while the proportion of civil servants, 8(17.8%), was the lowest ($X^2 = 34.899$, $df=5$, $p=0.001$).

Table 2 shows that at the time of presentation, all the patients, 44((100%), that presented with ruptured globe, and 71(68.3%) of those with penetrating eye injury were blind while 8(66.7%) who had eyelid injury had normal vision. A total of 137(70.6%) patients presented with blindness.

Table 1: Demographic Characteristics of patients that had emergency surgical procedures

Variable	Male No (%)	Female No (%)	Total
Age-group(yrs)			
0-9	30(75.0)	10(25.0)	40 (20.6)
10-19	10(66.7)	5(33.3)	15(7.7)
20-29	32(80.0)	8(20.0)	40(20.6)
30-39	27(79.4)	7(20.6)	34(17.5)
40-49	23(82.1)	5(17.9)	28(14.4)
50-59	9(90.0)	1(10.0)	10(5.2)
≥60	14(51.9)	13(48.1)	27(13.9)
Occupation			
Schooling	55 (77.5)	16(22.5)	71(36.6)
Civil servant	34 (75.6)	11(24.4)	45 (23.2)
Artisan	25(83.3)	5(16.7)	30(15.5)
Farming	18(81.8)	4(18.2)	22(11.3)
Trading	11 (52.4)	10(47.6)	21(10.8)
Dependant	2 (40.0)	3(60.0)	5(11.3)

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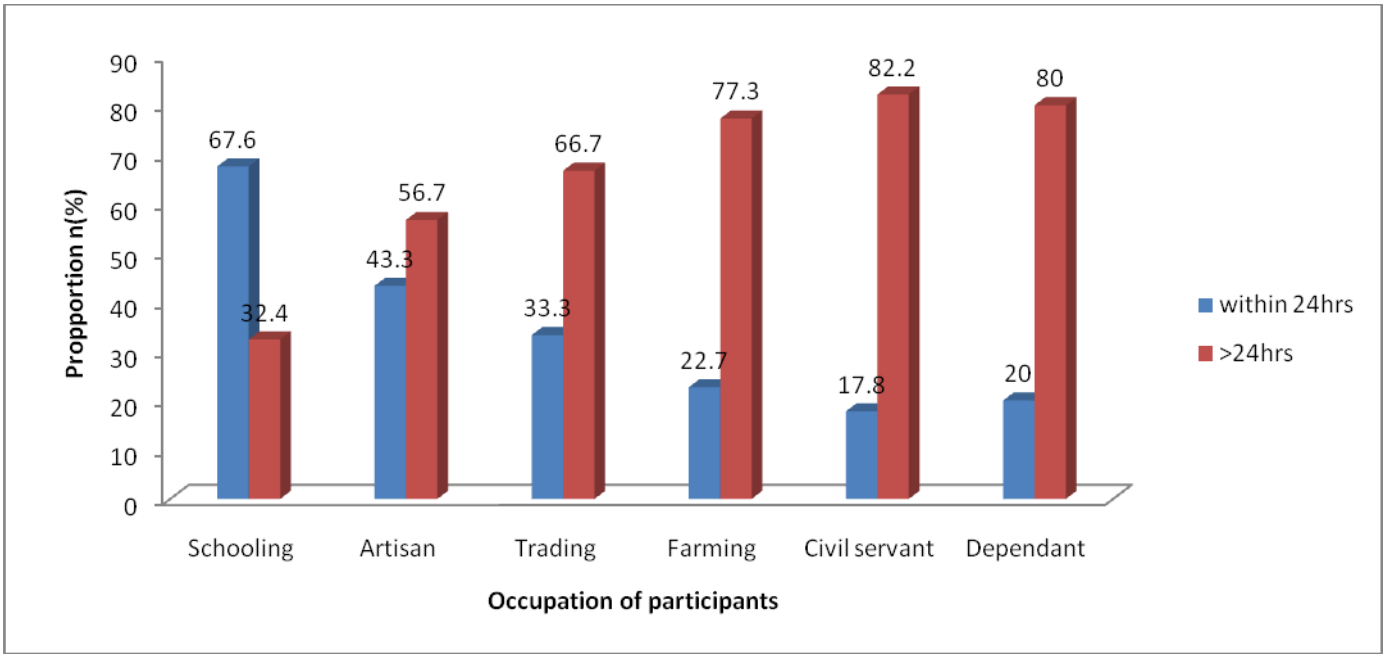

Figure 1: *Occupation and duration of symptoms before presentation of participants*

Table 2: Presenting visual acuity and classification of eye injury

Classification of eye injury	**≥6/18 n (%)**	**<6/18-3/60 n(%)**	**<3/60 n(%)**
Penetrating eye injury	3 (2.9)	30 (28.8)	71 (68.3)
Ruptured globe	0(0)	0(0)	44 (100)
Closed globe	0(0)	10 (35.7)	18(64.3)
Eye lid injury	8(66.7)	4(33.3)	0 (0)
Perforating eye injury	0 (0)	1(33.3)	2 (66.7)
RIOFB	0(0)	1 (33.3)	2(66.7)

Table 3 shows that about 1/3rd, 66(34.0%), of the patients had emergency surgical interventions same day of presentation in the eye facility. Corneo-scleral repair topped the list of surgeries and was the commonest, 106(54.6%), procedure carried out the same day of presentation ($X^2 = 28.817, df=7, p=0.001$). Figure 2 shows an open globe injury with removed RIOFB .

Table 4 shows that a 3rd of the patients, 28(34.1%) ,that presented within 24 hours had normal vision while only 19(16.1%) who presented after 24 hours still retained their vision 6 weeks post-operatively. A total of 8(88.9%) patients who presented with normal vision after injury and had the surgical procedure same day of presentation still significantly retained their good vision 6weeks post-operatively. The only patient that presented with normal vision and had visual acuity of less than 3/60 was a patient that developed traumatic cataract. Of the patients that presented with blindness, 7% of those that had surgery the same day of presentation regained normal vision while only 5% of those that had their surgery on a different day after presentation regained normal vision. These findings were statistically significant. However, occupation of patients did not show any effect on visual outcome.

Out of 137(70.6%) patients that presented with blindness, more than half, 111(57.2), remained blind while only 46(23.7%) of the patients had normal vision after 6 weeks of follow-up ($X^2 = 50.423, df=2, p=0.001$).

Table 3: Time of surgical intervention after presentation.

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Procedures	Same day n(%)	Other days n(%)
Corneo-scleral repair	46(43.4)	60(56.6)
Evisceration	2(4.9)	39(95.1)
Lid repair	10(45.5)	12(54.5)
AC wash-out	4(26.7)	11(73.3)
Lens extraction	0	4(100.0)
IOFB removal	3 (75.0)	1(25.0)
Conjunctival repair	1(100.0)	0
Socket reconstruction	0	1(100.0)
Total	66(34.0)	128(66.0)

Figure 2*: Open Globe Injury with removed RIOFB*

Table 4: Factors responsible for six weeks post operative visual outcome.

Variables	**Visual outcome**		
	>6/18 n(%)	**VI n(%)**	**<3/60 n(%)**
Occupation			
Government worker	13(28.3)	13(28.3)	20(43.5)
Non government worker	33(22.3)	24(16.5)	91(61.5)
Time of presentation			
Within 24hours	28(34.1)	13(15.9)	41(50.0)
>24hours	19(16.1)	24(21.4)	70(60.5)
Pre-operative vision			
Normal vision	10(90.9)	0(0)	1(9.1)
<6/18	29(63.0)	15(32.6)	2(4.3)
<3/60	7(5.1)	22(16.1)	108(78.8)
Time of surgery			
Same day of presentation with:			
normal vision	8(88.9)	0(0)	1(11.1)
visual impairment	16(57.1)	10(35.7)	2(7.1)
blindness	2(6.5)	7(22.6)	22(71.0)
Other days after presentation with:			
normal vision	2(100)	0	0
visual impairment	13(72.2)	5(27.8)	0
blindness	5(4.7)	15(14.2)	86(81.1)

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DISCUSSION

The emergency ocular procedures done during this period constituted 7.7% of all ophthalmic surgeries, and 16.3% of the total number of all ocular emergencies. This incidence is relatively high though ocular injuries are rarely life threatening; they can lead to significant short and long term morbidity, including permanent visual loss (15). The reported high incidence in other studies (16-18) included all ocular injuries involving those managed both medically and surgically. The earlier reported 10% incidence in this center included all ocular emergencies (19). Some of the ocular emergencies which might initially be managed medically might eventually require surgical interventions. This stresses the need to take any degree of ocular emergencies very seriously in order to prevent the resultant ocular morbidity. The observed male preponderance in this study was similar to many ocular injury- studies (20,21). The reason adduced for this observation was the fact that men were said to have greater exposure to potentially injury-producing hazards or are involved in occupations that predispose them to sustaining ocular injuries (16,22). Over 95% of these patients were less than 40 years of age, and the majority of these them were school-age groups. This is similar with many other studies (19,22-24). This places a huge burden on the young productive age of the population as blindness from the ocular injury imposes far-reaching physical, psychosocial, emotional and economic implications on the affected individual, the family and the society in general (25).

It was observed that the majority of the students significantly presented at the eye facility within 24 hours of injury while the civil servants were observed to present after 24 hours. It has been documented that successful patient outcomes in instances of emergencies depends on prompt recognition and appropriate initial management which indirectly depend on time of presentation to the eye facility (13,26). The early presentation observed among students might be due to fear of losing the sight at this young age. However, it should be noted that civil servants presented late to the eye facility. The reasons for this observation were not determined in this study but it might have been that government workers resorted to alternative eye care or they were not financially empowered. The information obtained might be useful in providing solutions to the problem of delayed/late presentations by this economically productive group of workers.

It was observed that at the time of presentation, all the patients that presented with ruptured globe and the majority of those with penetrating eye injury were blind while a substantial number that had eyelid injury had normal vision. This buttresses the fact that severity of injury significantly affects the presenting visual acuity (12). It is unfortunate that many of the ruptured globes that could not be salvaged had to be removed. Some of the patients that had closed injury had anterior chamber wash out.This contributed to a large of them presenting with blindness coupled with the other sequelae of closed injury which might include macular/optic nerve injury.

There were various surgical eye interventions carried out for emergency eye conditions. The top most of these conditions was corneo-scleral repair procedure similar to reported ophthalmic workload in most emergency units (27). This is followed by evisceration with or without orbital implant and the least was orbital reconstruction and conjunctival repair. It was also noted that less than half of the corneo-scleral repair procedures were done on the same day these patients presented in the eye facility and over 95% of the patients that had evisceration procedure were done on other days. This might be due to series of bureaucracy bottle-necks needed to be overcome coupled with patients' acceptance of eye surgery and cost of surgeries. For instance, many of the patients that required general anaesthesia had to wait for the available anaesthetists in the hospital and the results of investigations that were ordered before the surgery could be done. It is therefore recommended that the hospital management should help to reduce the waiting time by employing more skilled/trained anaesthetists and the government should support her citizens through universal National Health Insurance coverage policy to reduce out of pocket expenses for these injured patients.

This study revealed some of the predictive factors responsible for poor post-operative visual

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outcome of patients that had emergency eye procedures. The majority of the patients that presented after 24 hours to the eye facility had permanent vision loss while only 16% of these patients had good vision six weeks post-operatively. This shows the importance of early presentation for timely intervention in order to urgently preserve the remaining useful vision from the injured eyes. This is in line with a report that early presentation is known to influence good prognosis (28). The public needs to be sensitized through eye health promotion campaign to present early in the eye facility after ocular injury to reduce visual morbidity.

It has been documented that the presenting visual acuity which in turn depends on the severity of injury and ocular anatomical disruption, damage to the macular and or the optic nerve and relative afferent pupillary defect (RAPD) (12-29) significantly influenced the post-operative visual acuity in this study. This was similar to Gupta et al and Rahman et al reports which stated that initial poor visual acuity following open globe injury among other factors will significantly influence final outcome (12,30). In addition to the above, the time of surgery was one of the predictive factors of final visual outcome. The majority of the patients who presented with normal vision after the injury and had the surgical procedure same day of presentation still retained their vision 6 weeks post-operatively. The only patient that presented with normal vision and had visual acuity of less than 3/60 was a patient that developed traumatic cataract. Meanwhile, of the patients that presented with blindness, 7% of those that had surgery the same day of presentation regained normal vision while only 5% of those that had surgery on different days after presentation regained normal vision. This shows that timely surgical intervention could have positive influence on the final visual outcome although final visual outcome is a reflection of extent of damage, presenting visual acuity and ocular anatomical disruption and damage to the macular and/or optic nerve as documented earlier in the literature (29). Timely surgical intervention that could salvage any remaining useful vision is recommended. Therefore, removal of all agents of delay to timely surgical intervention should be vehemently pursued by both the patients and the managing team. These include: encouraging patients' uptake of eye surgical intervention, providing financial incentive or financial relief, enrolling all citizens on health insurance scheme policy and employing more specialists (e.g. dedicated anaesthetists and vitreo-retinal surgeons) and supportive eye care staff that will urgently provide expertise management to the eye-injured patients.

More than half of the patients that had emergency eye procedures were blind six weeks post-operatively. Some of these resulted from badly injured eye that could not be salvaged but needed to have primary evisceration on emergency. This is similar with many studies (6,12,21) since ocular injury is a major cause of monocular blindness. This sudden blindness in an otherwise healthy young man is reported to be devastating (21). This emphasizes the need to embark on awareness campaign programme to prevent or minimize the occurrence of eye injury as most were said to be largely preventable (12). In conclusion, the prevalence of eye emergency surgeries was high with over $4/5^{th}$ of these patients becoming blind six weeks post-operatively. Some of the factors responsible for poor visual outcome were delayed presentation, severity of eye injury which manifested in poor pre-operative visual acuity and delayed surgical intervention. Removal of all agents of delay to timely surgical intervention should be vehemently pursued by both patients and the managing team in order to reduce the resultant visual morbidity.

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