

**A 2- YEAR RETROSPECTIVE STUDY ON PREVALENCE,
PATTERN AND OUTCOME OF OCULAR TRAUMA IN
MBABANE GOVERNMENT REFERRAL HOSPITAL,
SWAZILAND**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD
OF DEGREE OF MASTERS IN MEDICINE (OPHTHALMOLOGY),
UNIVERSITY OF NAIROBI**

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DECLARATION

I declare that this dissertation is my original work and has not been presented for the award of a degree at any other university.

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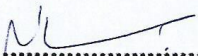
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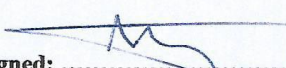
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DEDICATION

This work is dedicated to my husband, Mduduzi; my children Bethu & Thuba and my family for all their love, support and encouragement.

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I wish to express my gratitude to my supervisors; Dr Joseph Nyamori, Dr Steve Mukiri, and Dr Vincent Msiska for their much valued guidance, advice and corrections. All my lecturers, in particular Dr Gichuhi and fellow students for their support and encouragement.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Anterior Chamber
AV	Anterior Vitrectomy
BCVA	Best Corrected Visual Acuity
BETTS	Birmingham Eye Trauma Terminology System
BJO	British Journal of Ophthalmology
DIY	Do It Yourself
DOA	Date of Admission
DOD	Date of Discharge
FB	Foreign Body
GSH	Good Shepherd Hospital
IP	In-patient
IOL	Intraocular Lens
IOFB	Intraocular Foreign Body
KNH	Kenyatta National Hospital
LE	Left Eye
MGH	Mbabane Government Hospital
MTRH	Moi Teaching and Referral Hospital
NHRRB	National Health Research Review Board Ministry of Health Swaziland Government
OT	Ocular Trauma
OP	Out-patient
PC	Posterior Chamber
PCO	Posterior Capsular Opacity
PI	Peripheral Iridectomy
PPV	Pars Plana Vitrectomy
RAPD	Relative Afferent Pupillary Defect
RD	Retinal Detachment
RE	Right Eye
ROS	Removal of Sutures
RTA	Road Traffic Accident
SPSS	Statistical Package for Social Scientist
WHO	World Health Organisation

ABSTRACT

Objective: to determine the epidemiologic patterns, types and causes of ocular injuries, referral patterns, interventions, visual outcomes and complications of ocular trauma in Mbabane Government Hospital.

Methods and materials: this was a retrospective, hospital-based case series, in which all patients who attended the MGH eye unit with a diagnosis of ocular trauma between 1st January 2013 and 31st December 2014 were reviewed. The files of patients with ocular trauma were retrieved and a structured questionnaire was used to record the relevant data which was analysed using SPSS, confidence level of 95% was used. Outcome measures were post treatment visual acuity and complications resulting from the ocular trauma. Ethical approval obtained from the KNH Ethics, Research and Standards Committee and the NHRRB Ministry of Health Swaziland.

Results: Three hundred and ninety nine files (432 eyes) of ocular trauma patients were retrieved and analysed. Male: female ratio was 3.1:1, majority (29.6%) were in the 21-30 years age group. Home (43.1%) was the commonest setting of ocular trauma. Organic material was the commonest agent of trauma (23.6%) and closed globe injuries were more than open globe injuries (80% and 20% respectively). Using the WHO classification for VA on the injured eye, the majority 201(46.5%) of eyes had normal vision and 78 (18.1%) were blind at presentation. Lid contusion was the commonest 84 (19.4%) finding at presentation, a majority 331 (83%) of patients self-referred to MGH and most 245 (61.4%) presented within 1st day of injury. Most common intervention was medical treatment only 216 (50.0%) & most 114 (89.8%) had surgical interventions within 48 hrs. of admission. Open globe injuries had a poor visual prognosis. The commonest complication recorded was corneal scar 39 (9%).

Conclusion: ocular trauma occurred commonly in the young productive male and was found to be a significant cause of monocular visual impairment and blindness in MGH.

Recommendations: There is a need for prevention strategies to target young people (including students) and males, by promoting public awareness on prevention of ocular trauma and emphasizing the use of protective eyewear in the workplace and at home during activities.

1.0 CHAPTER ONE: INTRODUCTION

1.1.1 Definition and Classification of Ocular Trauma

Ocular trauma is any injury to the eyeball, its adnexa, orbit and periorbital structures. The adnexa includes eyelids, eyebrow and the lacrimal system. According to the BETT classification ocular trauma can be classified into either closed globe injuries such as contusions and lamellar lacerations, or open globe injuries such as penetrating lacerations, perforating lacerations, intraocular foreign bodies, ruptured globe or adnexal injuries.¹ Ocular trauma may be accidental or non-accidental. The trauma may be caused by different objects found in both work and home environments and these objects range from blunt to sharp objects, hot objects, chemical substances, electrical power source and different types of radiation such as UV & X-ray. A significant shift from workplace to home has been shown in some studies.²

1.1.2 Prevalence of Ocular trauma

Ocular trauma is a common preventable cause of monocular visual impairment and blindness worldwide. Using data from literature review and the WHO blindness data bank Negrel et al found that there are 55 million eye injuries per annum globally that result in restriction of daily activity, of which 19 million have at least unilateral permanent reduction in vision and 1.6 million are blind from their injuries.³

Ideally the prevalence of ocular trauma is determined by population based studies. In a population based study in which all ophthalmic departments in Scotland participated the incidence of ocular trauma that required admission to hospital was estimated to be 8.14 per 100,000 population.⁴ However most studies describe the proportion of ocular trauma amongst hospital based studies and it is variable ranging from 53.3% in Singapore,⁵ 1.06% in Pakistan, 5.0% in Central Ethiopia and 4.6% in South –South Nigeria. (ANNEX 1) In Swaziland there are no known studies that have been done on the prevalence of ocular trauma.

1.2 Literature Review

1.2.1 Pattern of Ocular Trauma

1.2.1.1 Age Sex Distribution

Most studies have shown that young males are victims of ocular trauma more than females in all age groups with the most vulnerable being children and young adults, this due to the aggressive nature of work and sporting activities done by males. The age at occurrence of ocular trauma is critical because if not treated or managed appropriately this can have negative implications on the future including studying or employment opportunities.^{6,7} In New Zealand the male: female was 2.9:1, similar to 3:1 in Central Ethiopia, 2.5:1 in MTRH Kenya and 2.2:1 in South Africa. A higher male predominance was seen with male: female ratio of 8.3:1 in Pakistan and 7.2:1 in KNH Kenya. (Annex 1).

The majority of injuries occurred in age groups 16-20 years and 26-30 years in New Zealand, similarly a mean age of 27 years in Central Ethiopia, 21-40 years in both KNH and MTRH Kenya and 21-30 years in South Africa. (Annex1) Whilst non supervision at play and domestic activity were implied in children, in the young adult aggressive behaviour, alcohol abuse, sports and reluctance to use protective eyewear at work accounted for the higher incidence.⁸

1.2.1.2 Place/Setting of ocular trauma

Most studies have shown that ocular trauma generally occurs at work, home, during sport activities, motor vehicle accidents or interpersonal trauma and varies amongst male and women. Among men outdoor related injuries accounted for most ocular injuries followed by work related injuries, whilst for women the most frequent cause was the same as that for men outdoor activity related but in contrast to men followed by home related work in a study done in New Zealand. Whilst in Scotland the home was found to be the most common place for ocular injuries followed by work place and sport/leisure facility, In India it was RTA followed by sports/recreational activities and work related. Whilst in China most injuries were work related followed by home related injuries and violence. (Annex1)

In Africa the setting or place of occurrence of ocular trauma was similar. In MTRH Kenya and Ghana the home was found to be the most common setting. In Nigeria there was some variation, in a study done in South –South Nigeria physical assault was most common

followed by RTA were and traditional eye medication (TEM). This is different from the finding of a study in Western Nigeria where about one third of the study population sustained the injury at home, followed by RTA and work related injuries. In South Africa most of the injuries occurred at home. (Annex1)

1.2.1.3 Type of injury

According to the BETT classification ocular trauma maybe classified into open globe injuries (OGI), closed globe injuries (CGI) or adnexal injuries. There is a variation in the type of globe injury sustained as shown in studies done in India, China, MTRH Kenya and Kwa Zulu Natal SA that open globe injuries were more than closed globe injuries. Whilst in other studies done in New Zealand and Ghana closed globe injuries were more than open globe injuries. (Annex1)

1.2.1.4 Circumstance and Agent of Ocular trauma

The circumstance of Ocular trauma in with most studies was accidental at 75.7% in Pakistan, 77.6% in Central Ethiopia, 54.3% in KNH Kenya and 71.8% in Kwa Zulu Natal South Africa. (Annex 1) The most common agent of trauma ranged from sharp objects in Pakistan wooden stick in India, metal fragments/nails in China, Organic agent In Ghana, sticks in MTRH Kenya to solid object in South Africa (Annex 1).

1.3 Interventions: Delay and Types

Delay in presentation following ocular trauma was found to be associated with poor visual outcome.^{9,10} Time between injury and presentation varied in the different countries, in China most patients (90.5%) presented earlier to ER in less than 24 hours and only 9.5% after 24 hours¹¹ whilst in India there was a slight delay where 74.5% presented within 2 days,¹² similarly in KNH Kenya Misa Funjika et al found that 78.9% presented within 72 hours of injury.¹³ and in South- South Nigeria there was a much longer delay in presentation with only 18.6% of patients presenting the same day of injury¹⁴

Visual acuity at presentation, type of globe injury and delay in presentation after ocular trauma were found to be prognostic factors for post treatment visual acuity in ocular trauma. In China CGI had better prognosis whilst OGI had poorer prognosis. In KNH Kenya Funjika

et al found that most of the injured eyes that were blind at admission were still blind at discharge. Whilst in South Africa Sukati et al found a reduction in acuity of 37.7% of the subjects following treatment.

Definitive treatment may be medical, surgical or both. Medical treatment starts from first aid medications administered before or upon arrival at the hospital, Tetanus Toxoid injection, Antibiotics and analgesics. Hospitalization or outpatient management is based on severity of injury and at times on patient's compliance. Surgical management also depends on the nature or type of injury and may range from short outpatient procedures that include lid laceration repairs and removal of ocular surface FB to inpatient procedures like globe repairs, eviscerations, corneal laceration repairs, AC washout and lens washout with or without lens insertion. In MTRH Kenya Momanyi et al found that FB removal was the predominant procedure done¹⁵ and Bonsaana in Ghana found that most patients received medical treatment only and ocular surface FB removal to be the commonest surgical intervention.¹⁶

1.4 Predictors of visual prognosis in ocular trauma

Agrawal R et al have shown that there are several factors that contribute to visual outcome following ocular trauma. Poor visual outcome has been associated with OGI, wounds extending to the posterior of globe, poor VA at presentation, delay in presentation, presence of RAPD at presentation, lenticular involvement, vitreous haemorrhage and presence of intraocular foreign bodies.

2.0 CHAPTER TWO: JUSTIFICATION

1. Study aimed to provide baseline information on the burden, patterns and outcomes of ocular trauma in the country as no such studies have been done.
2. The findings will help to facilitate the provision of integrated eye care, development or improvement of safety strategies to prevent such injuries.

2.1 Study Objectives

2.1.1 Broad Objective

To determine the proportion, pattern, interventions and visual outcome of ocular trauma in Mbabane Government Hospital (MGH) eye unit.

2.1.2 Specific Objectives

To Determine;

- a. The proportion of ocular trauma at MGH eye unit.
- b. The epidemiologic pattern of ocular trauma by age, sex, occupation of victim, location/ setting of ocular trauma, object/ agent of trauma, circumstance of trauma, type of injury, VA and ocular findings at presentation.
- c. The referral pattern, delay in presentation and intervention.
- d. The types of interventions rendered, visual outcome and complications due to ocular trauma.

3.0 CHAPTER THREE: MATERIALS AND METHODS

3.1 Materials

Structured questionnaire appendix I

3.2 Study Design

Retrospective hospital-based case series.

3.3 Study area

Mbabane Government Hospital, Swaziland eye unit (out and in patients)

3.4 Study population

The study population was all patients who attended MGH eye clinic or were admitted to the ward with a diagnosis of ocular trauma between 1st January 2013 and 31st December 2014.

3.5 Study setting

MGH is the only referral hospital in the country located in the Capital city Mbabane. It is the only government hospital with an ophthalmologist (with one other in the mission hospital). Patients are generally from all over the country. The country is 17363 km² in size and population based on the last estimates in 2011 was 1370424. The Eye department is run by an Ophthalmologist, 2 Optometrists, 5 Ophthalmic Nurses and 5 General Nurses.

Figure 1: Map of Southern Africa showing Swaziland



Figure 2: Map of Swaziland showing Location of Mbabane Government Hospital (MGH)



3.6 Case Definition

All new patients diagnosed with ocular trauma seen in the eye clinic or admitted to the ward from 1st January 2013 to 31st December 2014.

3.7 Inclusion criteria

Records of patients of all ages with ocular trauma who attended the MGH Eye Clinic or were admitted to the ward at MGH within the study period.

3.8 Exclusion criteria

Missing patient files.

3.9 Sample size calculation

The following sample size determination formula for finite population correction (Wanga & Lemeshow,1991)¹⁷ was used to estimate the proportion of population study size.

$$n^1 = \frac{NZ^2P(1 - P)}{d^2(N - 1) + Z^2P(1 - P)}$$

Where

n' = sample size with finite population correction,

N = size of the target population = 480 (20 x 24 months) (estimated minimal number of trauma patients seen in the eye unit, Mbabane Government Hospital is approximately 20 patients per month according to the registry book)

Z = statistic for 95% level of confidence (1.96)

P = estimated prevalence of ocular trauma – 4.06% ^[29]

d = margin of error = 2.1%

$$n^1 = \frac{480 \times 1.96^2 \times 0.0406(1 - 0.0406)}{0.021^2(480 - 1) + 1.96^2 \times 0.0406(1 - 0.0406)}$$

$$n^1 = 200$$

200 Patients (minimal sample size)

3.10 Data collection procedure

The date of attendance or hospitalization, name, age, and the patient number were obtained from the out-patient attendance and in-patient record books in the clinic and the ward, respectively for all patients with a diagnosis of ocular trauma with the help of the records officers. This information was then used to retrieve files from the filing cabinets in the eye clinic records department. Files which meet inclusion criteria were selected and the relevant data was collected and entered into the structured questionnaire shown in Appendix III.

3.11 Data management and analysis

The files of patients with a diagnosis of ocular trauma were retrieved and a structured questionnaire was used to record the relevant data. Each questionnaire was cross checked for completeness after data collection each day and double entry of questionnaire into Microsoft Excel 2010 was done to reduce errors entered and then analysed using SPSS with the help of a statistician. A confidence level of 95% was used. Descriptive analysis was done to determine the frequencies and proportions for the various variables (continuous/ categorical) and presented in tables and graphs where appropriate. Significant differences and associations were determined by p values of less than 0.05. A separate hard drive was used to back up computer data on daily basis and stored safely.

3.12 Main outcome measures

The main outcome measures were:

- Post treatment best corrected visual acuity
- Complications resulting from ocular trauma

3.13 Ethical consideration

3.13.1 Confidentiality

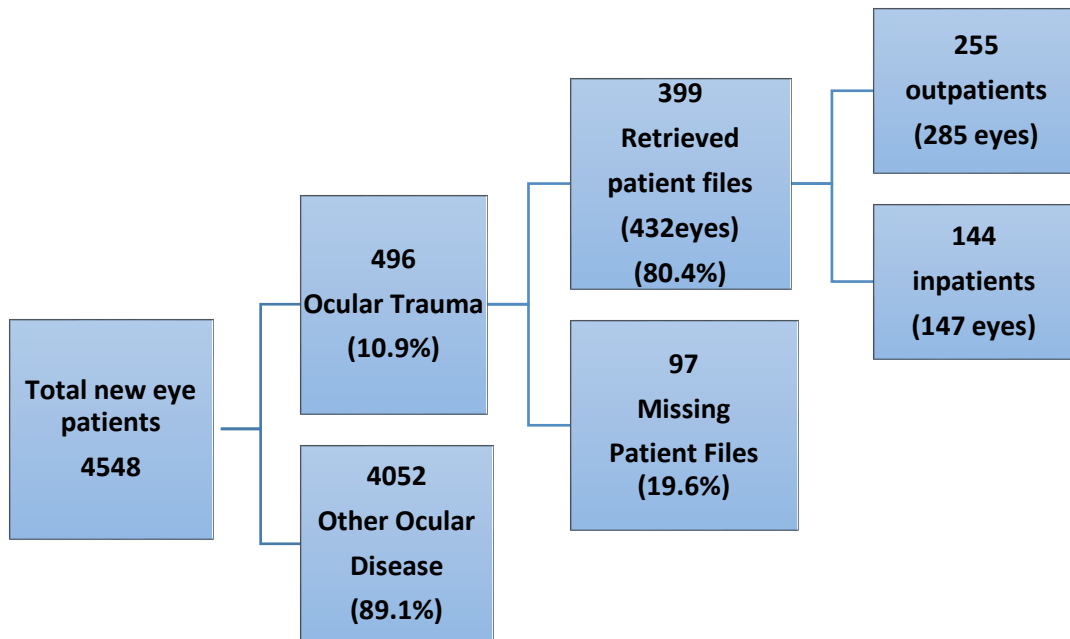
Patients' confidentiality was strictly observed by coding patient's names and information into the questioner and these code questioners were subsequently used for reference, analysis and presentation of the findings of this study. The data and information was only available to the investigators and the statistician. The coded questioners were stored and transported in a safe and secure locker. None of the patients were still on follow up during the study so there was no contact with any of them, only the patient records/files were used.

3.13.2 Approval by Ethics Committees

Approval was obtained from the Kenyatta National Hospital (KNH) / University of Nairobi (UON) Ethics and Research Committees and the National Health Research Review Board Ministry of Health Swaziland Government before commencement of study. The results of this study were shared with the relevant stake-holders including MGH, Ministry of Health Swaziland and KNH/UON to help improve service delivery and formulate preventive measures with regards to ocular trauma.

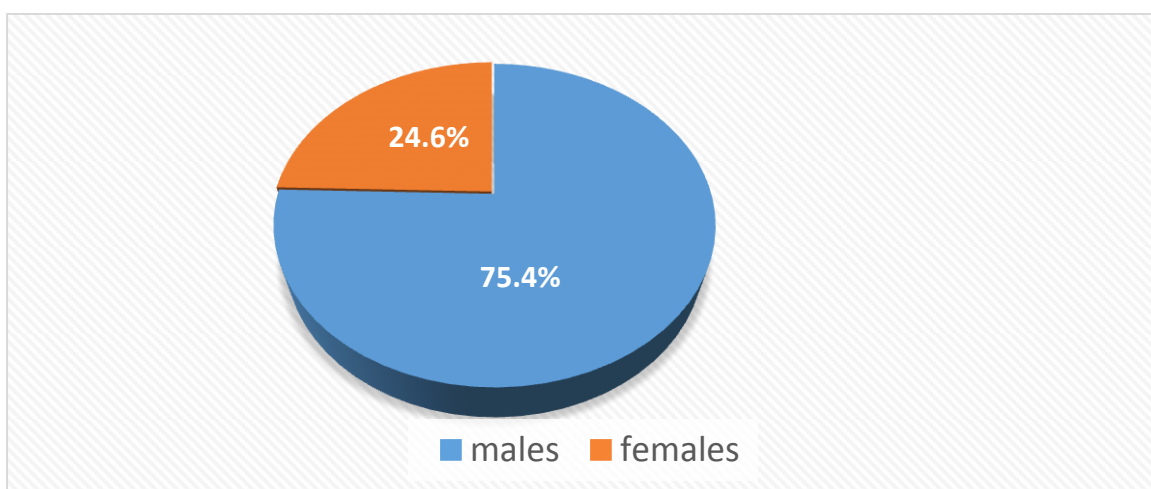
4.0 CHAPTER FOUR: RESULTS

Figure 3: Flow chart showing data Collection at MGH eye unit



From the out-patient and in-patient record books of the eye unit in Mbabane Government Hospital (MGH) from 1st January 2013 to 31 December 2014 a total of 4548 new patients were attended to. Four hundred and ninety six (496) were ocular trauma patients making a proportion of 10.9% (95% CI: 10.0 -11.8).

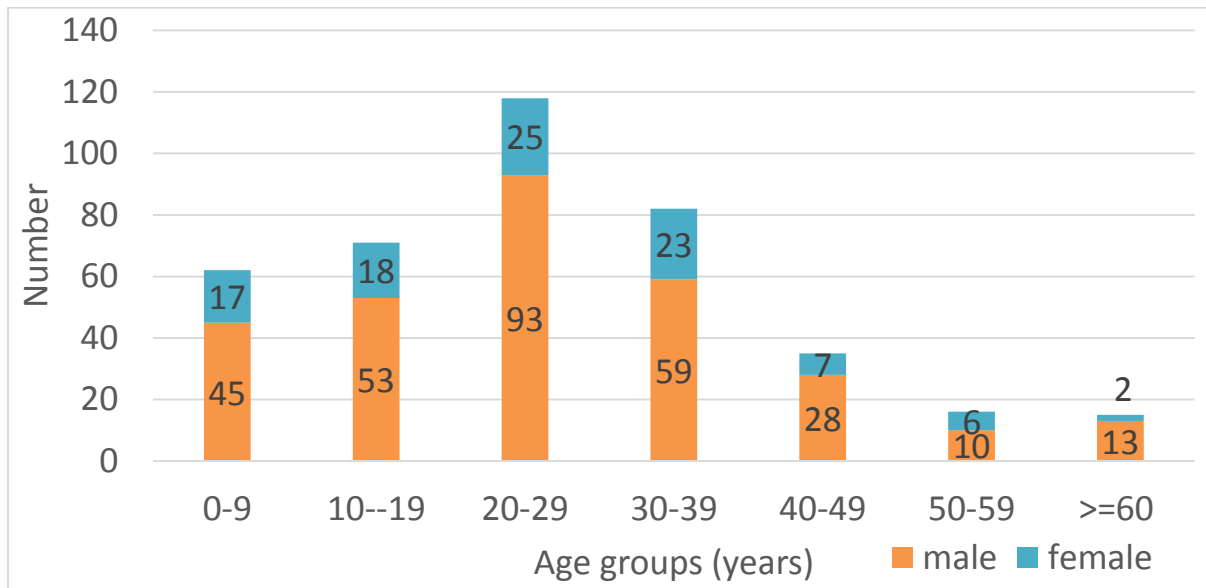
Figure 4 : Distribution by Sex (n=399)



The male: female ratio for ocular trauma patients 3.1:1

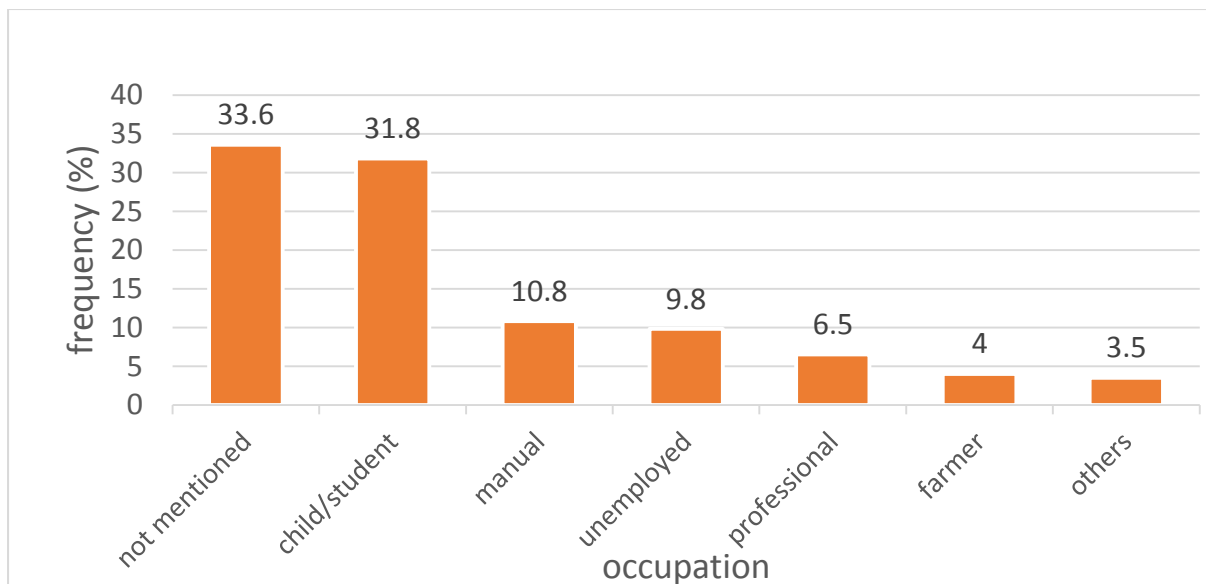
95% CI female (20.1- 28.6) male (71.4- 79.9)

Figure 5 : Distribution by Age and Sex (n=399)



The mean age was 26.1 ± 15.6 , median age (IQR) 25years (15-34) and range 4 months to 76 years. The majority 200 (50.1%) of patients with ocular trauma were 20 -39 years and 17.8% were 10-19 years.

Figure 6 : Occupation of patient (n=399)

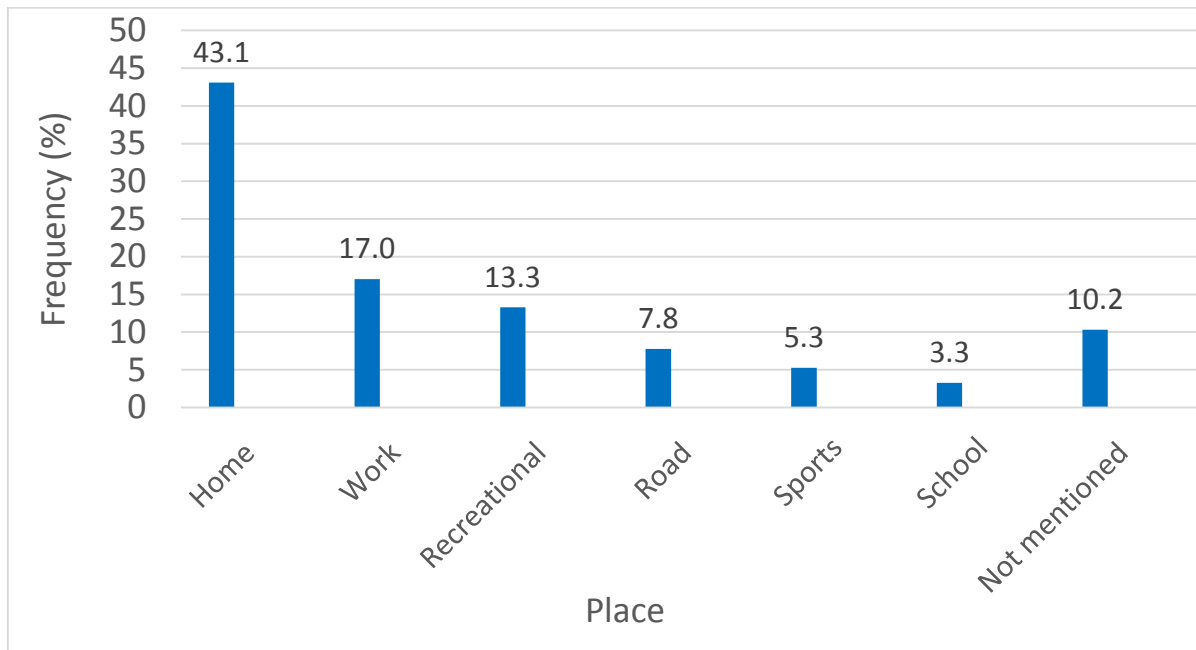


*Others included housewife, cleaner, security guard & retired.

For 134 (33.6%) of the patients occupation was not recorded/ mentioned.

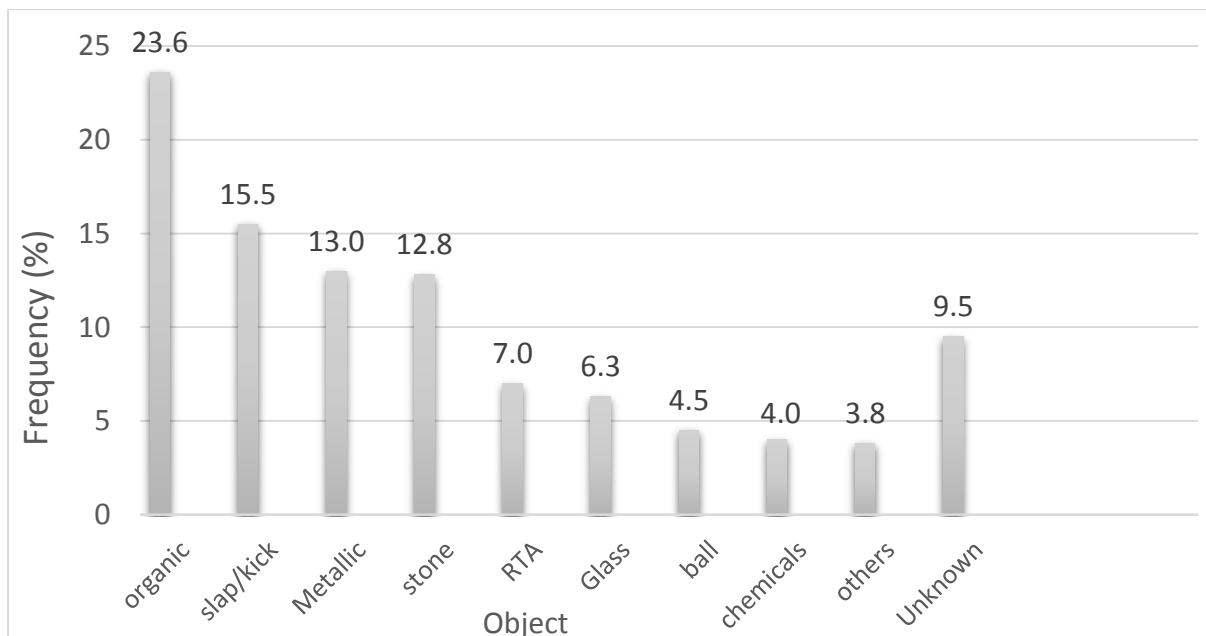
Ocular trauma occurred commonly among children/students 127 (31.8%) followed by those who do manual work (10.8%).

Figure 7 : Setting where trauma occurred (n=399)



Home was the commonest place of occurrence of ocular trauma (43.1%), followed by work (17.0%) and was not recorded in 41 (10.2%). The sport commonly involved was soccer.

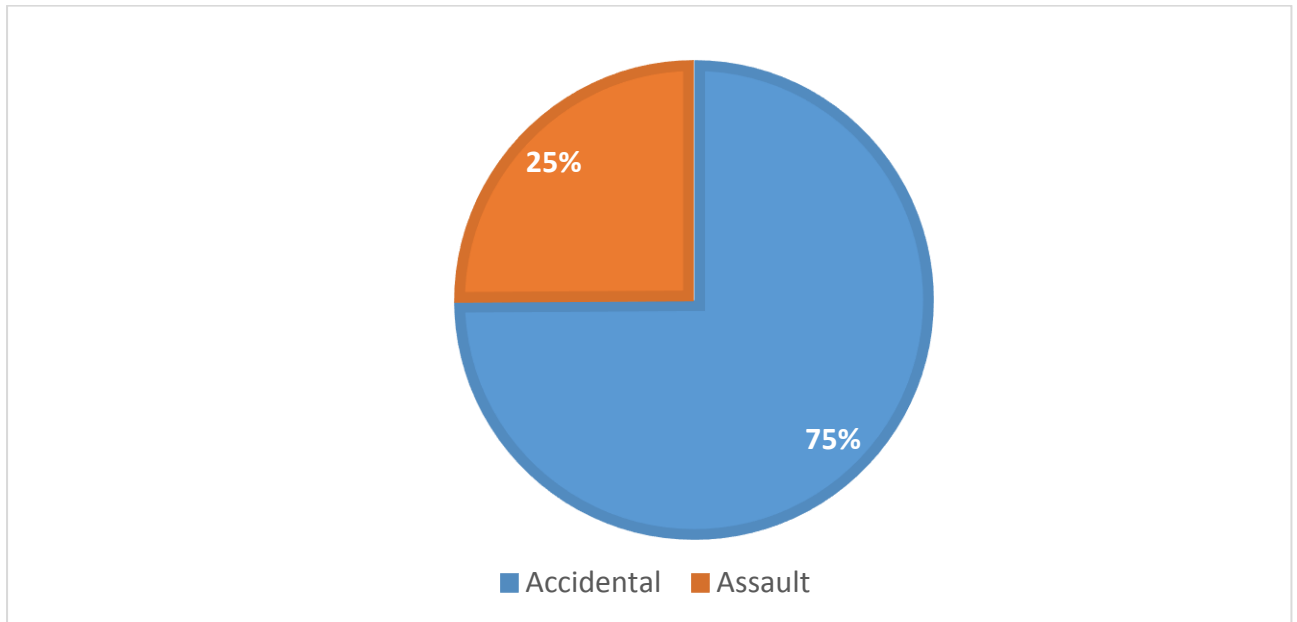
Figure 8 : Object causing Ocular Trauma (n=399)



*Others = fire, hot water, rubber, cable, belt

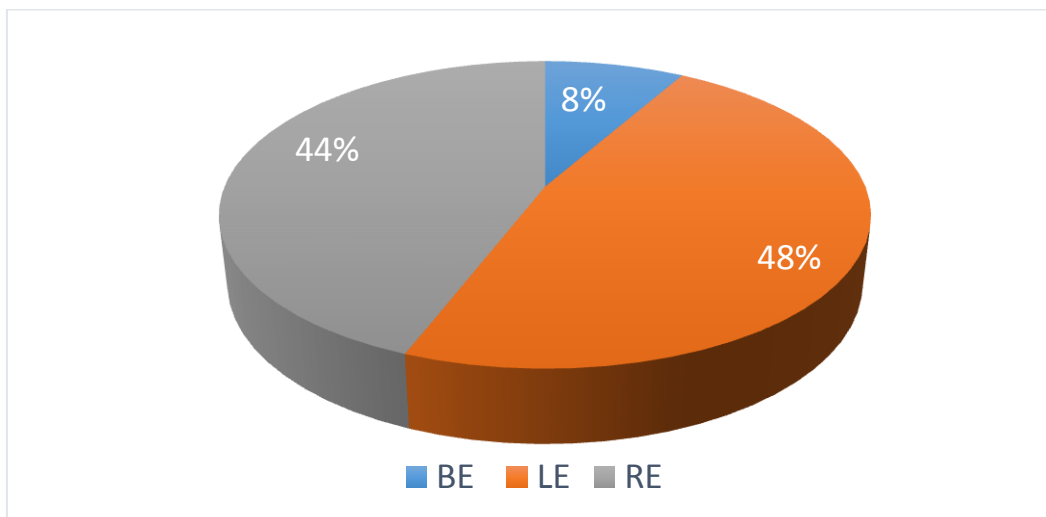
Commonest object of trauma was organic i.e. stick, wood, twig (23.6%), followed by the fist, slap, elbow, knee or finger at 15.5% then metallic (13.0%).

Figure 9 : Circumstance of Ocular Trauma (n=399)



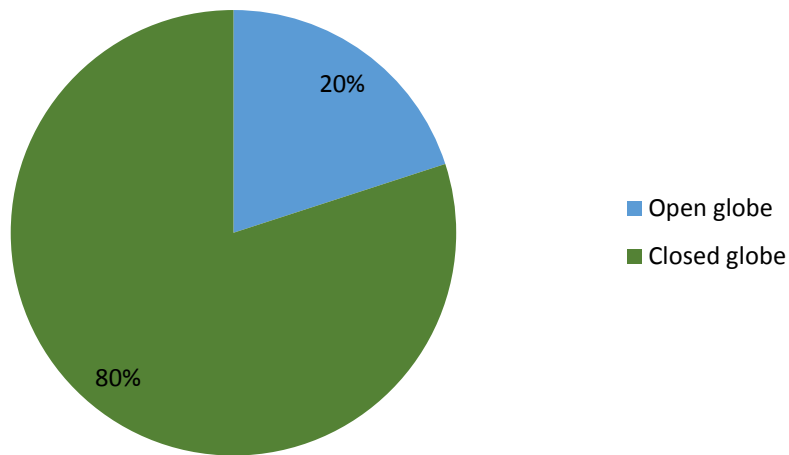
Majority (75%) of injuries were accidental & 25% were assault related. Assaults related trauma occurred commonly at recreational places and mainly affected the young aged 20 – 40 years.

Figure 10 : Injured Eye: Unilateral vs. Bilateral (n=399)



Only 33 (8%) of the patients presented with bilateral eye injuries. They were associated with chemical injury (cleaning agents, paint, battery acid, and paraffin), hot water, fire and RTA. Most were closed globe injuries and only 1 had open globe injury in one eye.

Figure 11: Type of Globe Injury (n=399)



Majority of patients 345 (80%) had closed globe injuries

Table 1: Distribution of type of globe injury by outpatient and inpatient (n=432 eyes)

Type of globe injury	Outpatients n (%)	Inpatients n (%)
Closed	283 (99.3)	62 (42.2)
Open	*2 (0.7)	85 (57.8)
Total	285 (100)	147 (100)

* Referred to GSH because the ophthalmologist was not available.

For outpatients majority 283 (99.3%) of patients had closed globe injuries and for inpatients most 85 (57.8%) had open globe injuries. Only 1 of the inpatients with open globe injuries had bilateral injuries with only 1 eye having corneal laceration with prolapse the other eye had subconjunctival haemorrhage and ecchymosis.

Table 2 : Visual Acuity at initial presentation in injured eye (n=432 eyes)

WHO Classification	n (%)
6/6 - <6/18 (Normal vision)	201 (46.5)
6/18 - <6/60 (Visual impairment)	78 (18.1)
6/60 - < 3/60 (Severe visual Impairment)	41 (9.5)
3/60 – NPL (Blind)	78 (18.1)
Not Done	34 (7.8)
Total	432 (100)

Majority 201 (46.5%) of the patients seen with ocular trauma at MGH had normal visual acuity, 119 (27.60%) had some form of visual impairment and 78 (18.1%) were blind at initial presentation according to the WHO classification of visual acuity in the injured eye.

Only 3 patients were blind in both eyes at presentation. For all 3 patients only 1 eye had ocular trauma, for one patient the non-traumatised eye had advanced glaucoma and for the other 2 patients the non-traumatised eyes each had cataracts.

Table 3 : Ocular findings at initial presentation at MGH

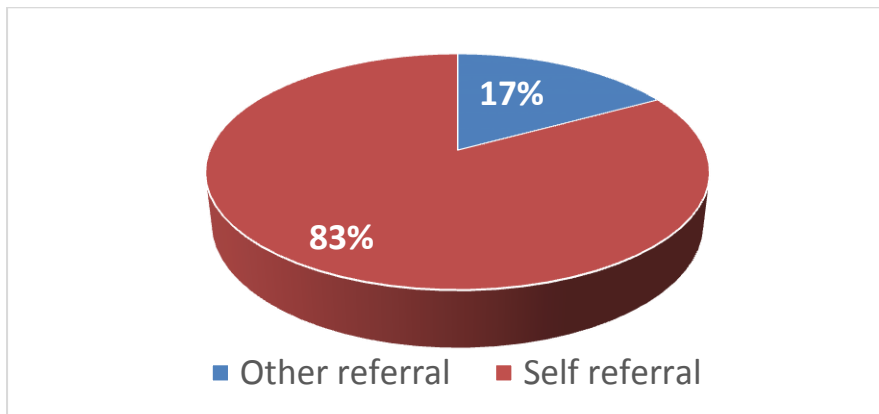
Ocular Finding* (432eyes)	n (%)
Conjunctival laceration, FB, chemosis, subconjunctival haemorrhage	92 (21.3)
Lid contusion	84 (19.4)
Corneal FB, ulcer/ abrasion	78 (18.1)
Lid laceration	48 (11.1)
Corneal laceration	37 (8.6)
Uveitis	27 (6.3)
Corneal scleral laceration	25 (5.8)
Hyphaema	20 (4.6)
Traumatic cataract	19 (4.4)
Ruptured globe	15 (3.5)
scleral laceration	6 (1.4)
Dislocated lens	6 (1.4)
Vitreous haemorrhage	6 (1.4)
Orbital cellulitis	4 (0.9)
Endophthalmitis	2 (0.5)
Others	17 (3.9)

*multiple findings in one eye,

**Others: Commotio retina, RD, orbital wall #, intra orbital FB, intra ocular FB, raised IOP, muscle injury.

The total findings (486) in table 3 are more than n (432) because of multiple findings in one eye in trauma patients

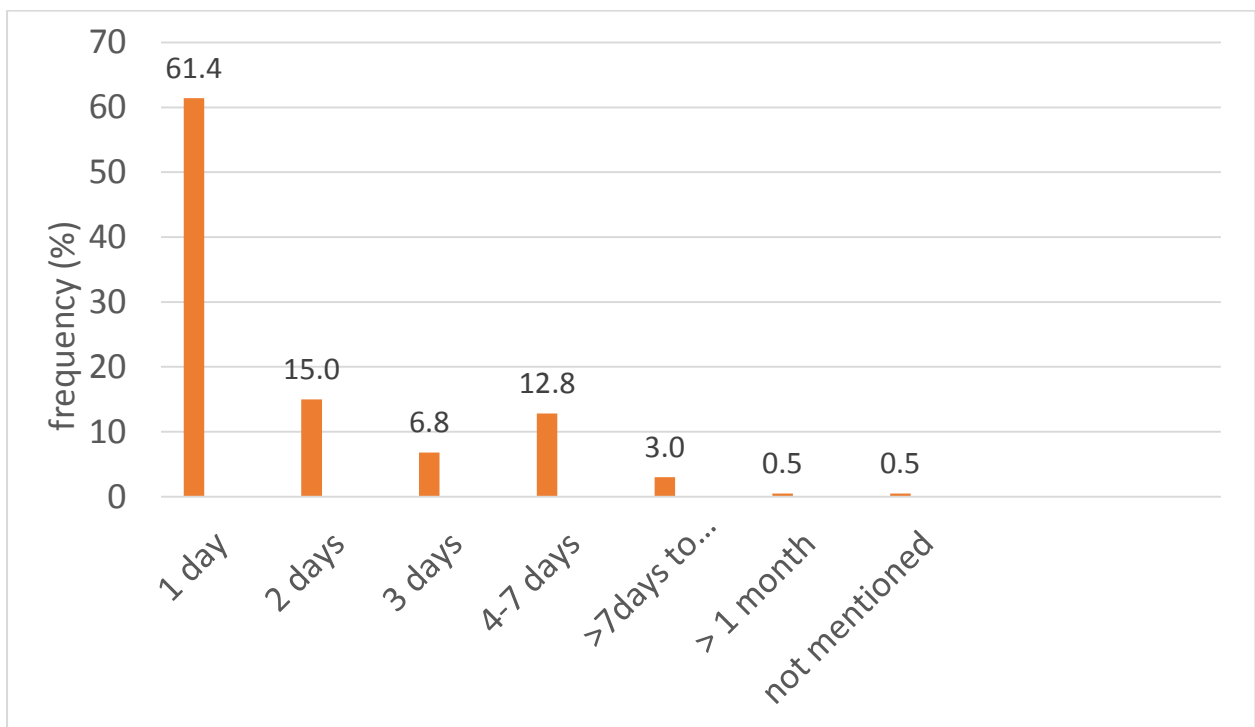
Figure 12: Referral Pattern to MGH (n=399)



*Other referral: referred from other health facility

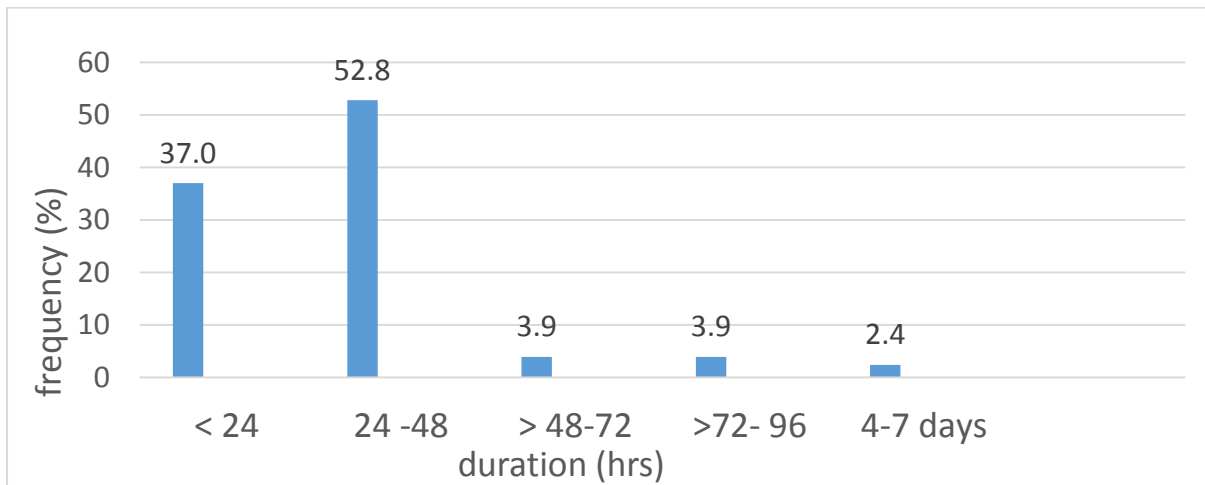
Most of the patients seen at the MGH eye unit were self-referral (83%).

Figure 13 : Duration between injury and presentation to MGH (n=399)



Majority 245 (61.4%) presented within 24 hours of injury, followed by 60 (15.0%) within 2 days of injury as indicated in the figure above.

Figure 14 : Duration between admission and Surgical intervention (n=127)



Only 127 eyes from the 144 admitted patients needed surgery. 47 (37%) had surgery done same day, 67 (52.8%) had surgery after 24 hours of admission but less than 48 hours and 3 (2.4%) had surgery after 4 days but less than 7 days after admission. 1 of the 3 patients had been admitted with orbital cellulitis that complicated into a lid abscess during the admission and had to be taken to theatre for incision and drainage. For the other 2 the surgeon was not available.

Table 4: Intervention given at MGH (n=432 eyes)

*Intervention	n (%)
Medical only	216 (50.0)
lid repair	48 (11.1)
Conjunctival + Corneal FB removal	47 (10.9)
Corneal repair	37 (8.6)
corneo -scleral repair	25 (5.8)
LWO	25 (5.8)
AC washout	16 (3.7)
irrigation	14 (3.2)
1° evisceration	12 (2.8)
Scleral repair	6 (1.4)
Others	6 (1.4)

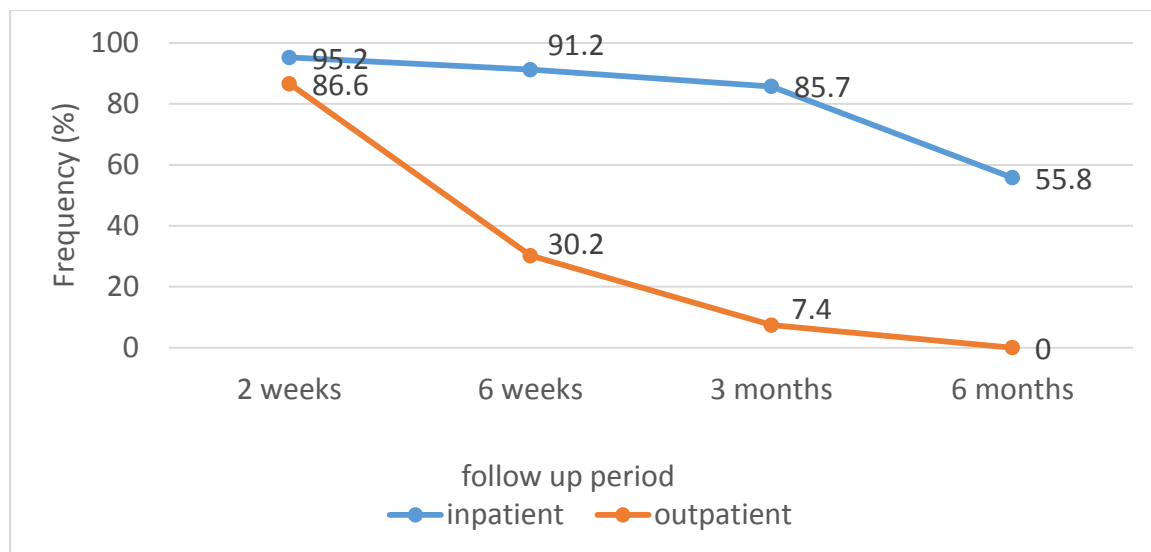
*Some eyes had more than one intervention thus the total findings (452) in table 4 above are more than n (432)

** Others: I & D, IV Abs, orbitotomy + FB removal, muscle reinsertion

The most common intervention was medical treatment only 216 (50.0%), followed by lid repair 48 (11.1%) and corneal FB removal 47 (10.9%)

8 referred to RSA (7 for VR Surgeon and 1 to Maxillofacial Surgeon).

Figure 15 : Follow up distribution up to 6 months after intervention (n=432 eyes)



There was a quick decline in follow up in out-patient group compared to the in-patient group. At 2 weeks follow up was 95.2% for in-patient group and 86.6% for out-patient group and by 6 months in-patient follow up was 55.8% and out-patient was at 0.0%

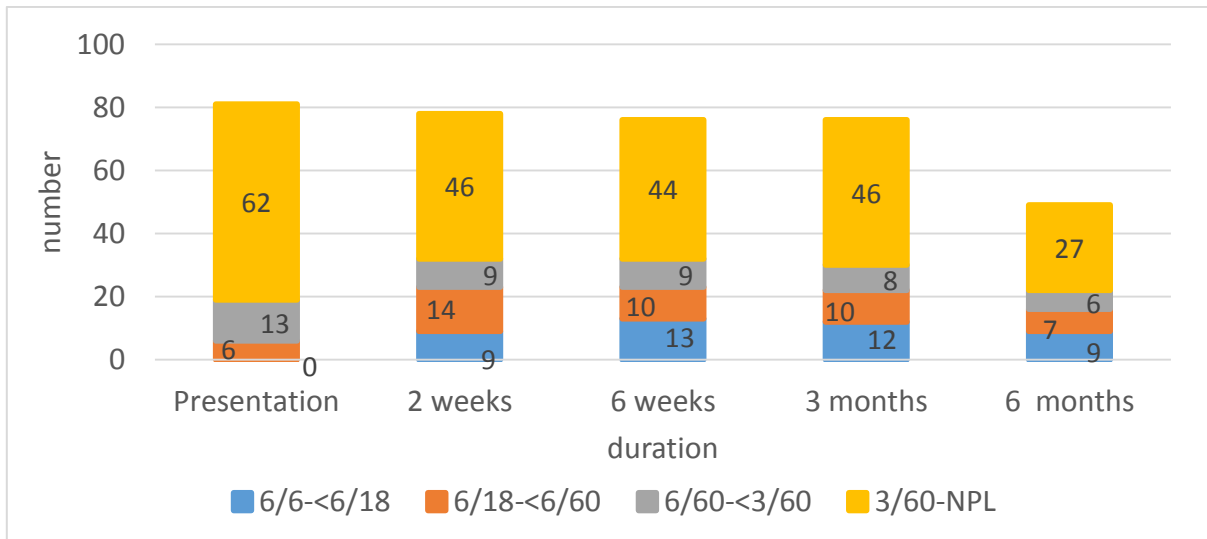
Table 5: Follow up of Visual Acuity (VA) at presentation up to 6 months of follow up

WHO	Presentation	At 2 weeks	At 6 weeks	At 3 months	At 6 months
6/6-<6/18 Normal	201 (46.5)	256 (66.1)	124 (56.4)	61 (41.5)	32 (39.0)
6/18-<6/60 Moderate visual impairment	78 (18.1)	47 (12.1)	25 (11.4)	20 (13.6)	13 (15.9)
6/60-<3/60 Severe visual impairment	41 (9.5)	14 (3.6)	12 (5.5)	10 (6.8)	7 (8.5)
3/60-NPL Blind	78 (18.1)	51 (13.2)	48 (21.8)	48 (32.7)	30 (36.6)
ND	34 (7.8)	19 (5.0)	11 (4.9)	8 (5.4)	0 (0.0)
Total	432 (100)	387 (100)	220 (100)	147 (100)	82 (100)

ND = VA not done

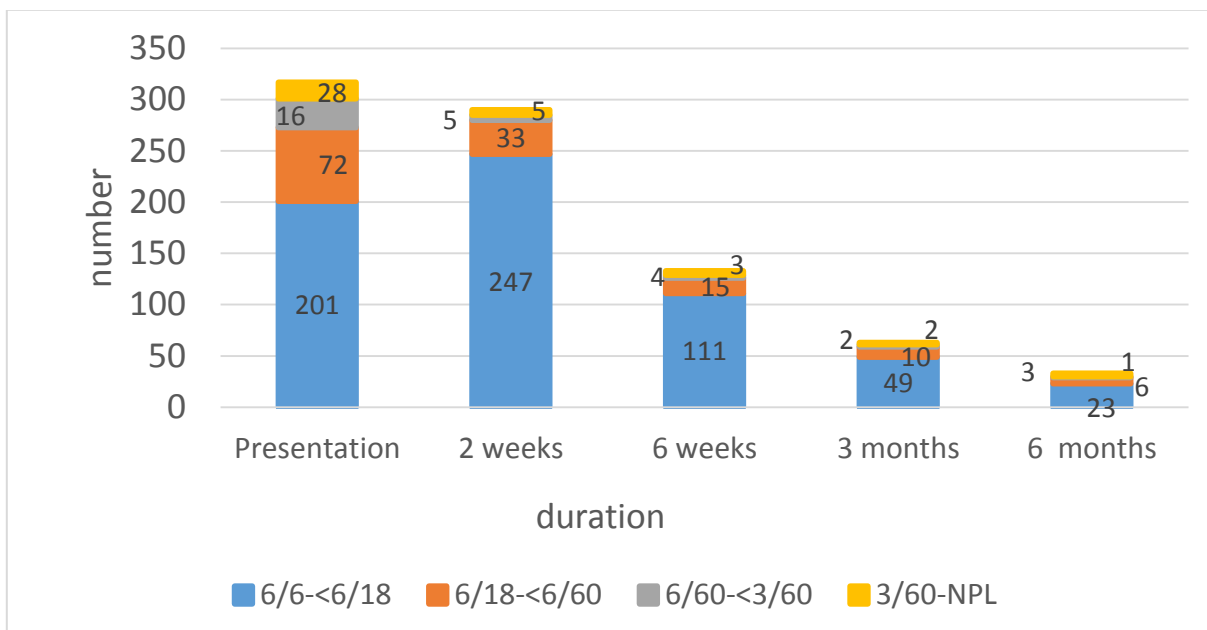
Within 2 weeks of follow-up 66.1% of the patients had normal vision compared to 46.5% at presentation and those with vision $\leq 3/60$ reduced from 18.1% at presentation to 13.2%

Figure 16 : Distribution of Visual Acuity for Open Globe injuries at presentation up to 6 months follow up



Open globe injuries had a poor VA at presentation and though there is improvement in VA at 6 months there is still almost half (27) of the patients that are still blind.

Figure 17: Distribution of Visual Acuity for Closed Globe Injuries at Presentation up to 6 months follow up



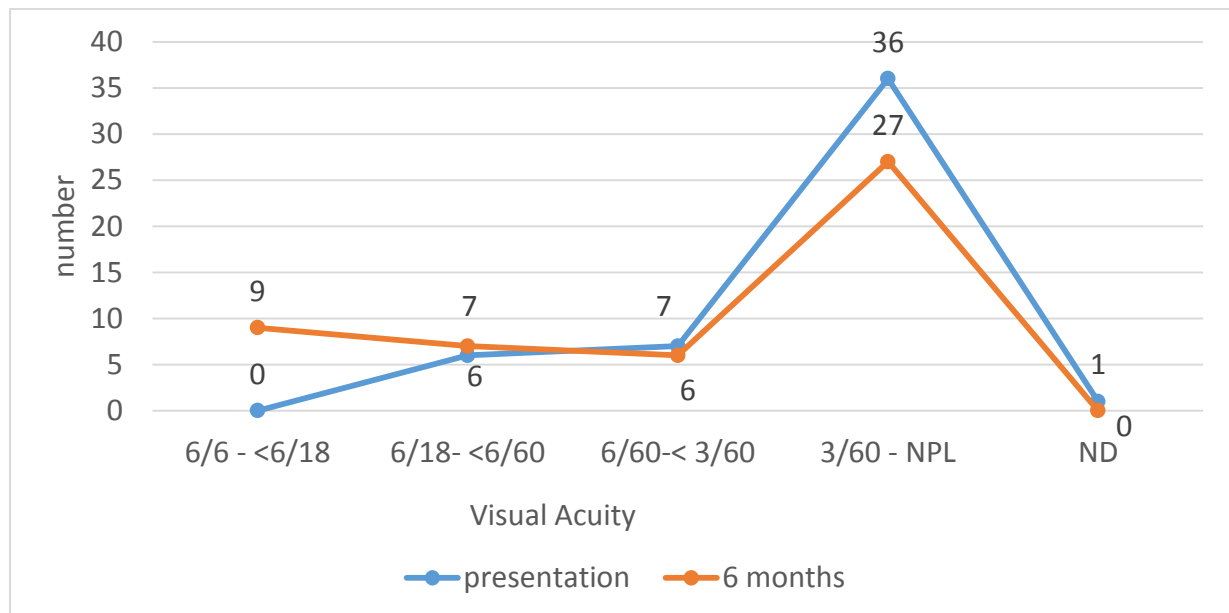
Closed globe injuries had better vision at presentation and all other visits up to 6 months.

Table 6 : VA at presentation and at 6months for patients who attended all visits up to 6 months

WHO Classification	At presentation	At 6 months	P value
6/6-<6/18	3 (3.7)	32 (39.0)	<0.001
6/18-<6/60	11 (13.4)	13 (15.9)	
6/60-<3/60	18 (22.0)	7 (8.5)	
3/60- NPL	44 (53.7)	30 (36.6)	
Not done	6 (7.3)	0 (0.0)	

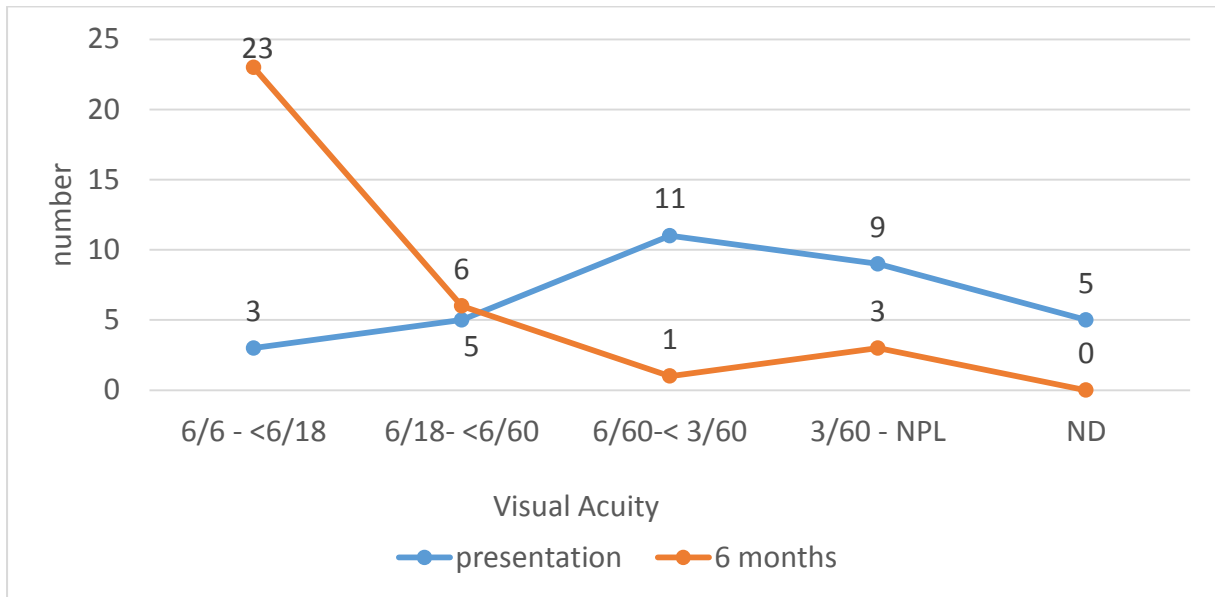
For 82 patients who attended all follow ups up to 6months there was an improvement noted in VA

Figure 18: Visual Acuity at presentation and at 6 months for patients who attended all visits up to 6 months with Open Globe injury



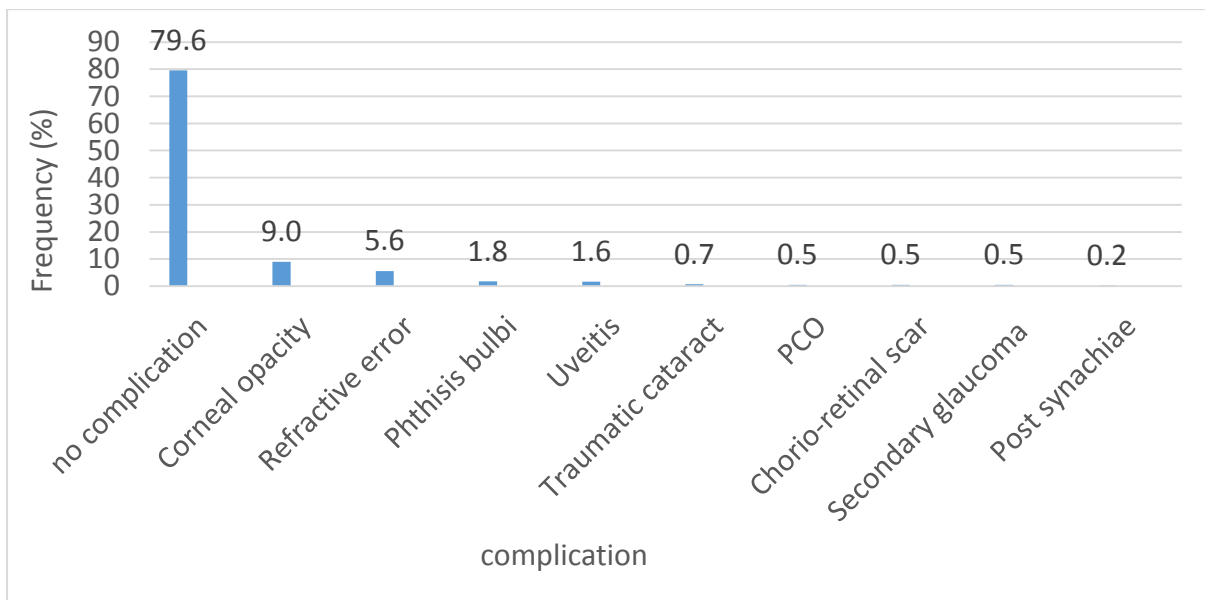
An improvement in VA is noted but still most patients are blind at last follow up.

Figure 19: Visual Acuity at presentation and at 6 months for patients who attended all visits up to 6 months with Closed Globe Injury



An improvement noted in VA for closed globe injuries

Figure 20: Long term Complication of Ocular Trauma as at last Follow up (n=432 eyes)



The majority of eyes 344 (79.6%) had no complications recorded and corneal opacity was the most common complication recorded at 9.0%

5.0 CHAPTER FIVE: DISCUSSION

There were 4,548 new patients with various eye conditions seen in MGH Eye unit of whom 496 had ocular trauma, giving a proportion of 10.9%. This is consistent with other hospital based studies that showed ocular trauma accounts for 5 - 16% of all ophthalmic unit visits.³ This may not represent the total number of patients with ocular trauma, as less severe injuries will not present to hospital, but it provides information regarding vision threatening injuries which are of great concern. Three hundred and ninety nine (399) files consisting of four hundred and thirty two (432) eyes were reviewed, of which 144 (36.09%) were inpatients and 255 (63.91%) were outpatients.

The majority 301 (75.4%) were male and 98 (24.6%) were female giving a male to female ratio of 3.1:1. This difference in males and females was statistically significant [95% CI female (20.1- 28.6) male (71.4- 79.9)]. The predominance of males to ocular trauma is similar to that found in other studies, such as of 2.8:1 in New Zealand, 3:1 in Central Ethiopia, 2.2:1 in KZN South Africa and 2.5:1 at MTRH in Kenya. (Annex 1) This higher frequency of ocular trauma in males seen in our study population occurred in all age groups [figure 5]. This may be due to that males are generally aggressive, do more manual type of work and their participation in sporting activities or hobbies that are risky or too physical.

The age range in this study was 4 months to 76 years with a median (IQR) age of 25 years (15.0- 34.0) and a mean of 26.1 years (+/-15.6). About half (50.13%) of the patients seen with ocular trauma were in the 20 -39 year's age groups followed by the 10-19 years age group (17.54%) and 0-9 years age group (15.5%) [figure5], this is in keeping with other studies, Nguyo et al (2016) in a study done in Kikuyu Eye Hospital found the majority (53%) were in the 21-40 years age group¹⁸ whilst in KZN South Africa and Ghana the occurrence of trauma in this age group was found to be 52.3% and 48.5% respectively. (Annex1) Of concern is the age groups 0-9 years 62 (15.5%) because of the high risk of amblyopia and the many disability adjusted life years ahead of them if these injuries are not managed appropriately.

Occupation was not recorded for 134 (33.6%), of those with recorded occupation children and students (including tertiary) were the majority 127 (31.8%) group in whom ocular trauma occurred [Figure 6] with most injuries occurring during play or sport. This finding is consistent with that of Momanyi et al at MTRH in Kenya¹⁵ and Bansaana et al in Ghana¹⁶ who found that ocular trauma occurred more commonly among children/ students at 54.8%, and 35.2% respectively. Manual workers made up 10.8% and despite the high risk of occupational injuries associated with manual work there was no record on use or non-use of eye protective wear.

In keeping with other studies ocular trauma occurred mostly at home 172 (43.11%) followed by workplace 68 (17.04%) [Figure 7]. Desai et al showed the home to be the commonest setting for injury in the UK, similarly in MTRH Kenya & Kwa Zulu Natal South Africa the home was found to be the most common place of occurrence of ocular trauma. (Annex1) Injury in the home occurred during collection or chopping of firewood, home chores and child play. The sport commonly involved in ocular trauma was soccer.

The most common agent of trauma was organic (which included stick, wood, twig) with 94 (23.6%) [Figure 8] especially in children during child play and in adults during domestic chores. This finding is consistent with other studies done in India, MTRH Kenya and Ghana (Annex1), but different from the findings of a study done in Anwar Paracha Eye Hospital, Pakistan where sharp objects were the most common (71.4%) agent of trauma¹⁹

The circumstance of ocular trauma was mostly accidental 299 (75%) [Figure 9], occurring during child play, sport, home chores which include gathering and chopping of wood as some of the areas in the country still use wood for food preparation and heating up their houses, also during home improvement projects and unsafe working environment. This high accidental nature of ocular trauma is consistent with findings in other studies such as 75% in Pakistan, 77.6% in Central Ethiopia and 71.8% in Kwa Zulu Natal SA (Annex1).

In this study unilateral eye trauma was more common 366 (92%) and bilateral eye injuries were

only 33 (8%) [figure10]. This is similar to 97.5% in South Africa⁶ and 90.7% in Ghana¹⁶ where majority of injuries were unilateral. The bilateral injuries in this study were associated with cleaning agents, paint, battery acid, paraffin, hot water, fire and RTA. The unilateral eye trauma seen highlights the fact that trauma is an important cause of monocular blindness. Our study did not show significant association between involvements of either eye, right eye was injured in 176 (44%) patients and the left eye in 190 (48%) patients [Figure 10] and in a study done in Uttarakhand India 2013 the left eye was involved in 84 (50.9%) and the right eye in 72 (43.6%).¹²

Closed globe injuries were more common accounting for 345 eyes (80.0%) and open globe injuries accounted for 87 eyes (20.0%) [Figure 11], this is in keeping with a study in New Zealand where 69% were closed globe injuries.²⁰ Among the inpatients open globe injuries 85(57.8%) were more than closed globe injuries 62(42.2%), [Table1] consistent with the findings of Misa Funjika where open globe injuries accounted for 90.6% of the injuries in patients admitted into the ward¹³. The proportion of closed globe injuries admitted is higher in our study because MGH is the only government facility with an eye specialist so there is a high referral of cases that would have been managed in outpatient clinic had they been seen by an eye specialist at the referring facility. Given the poor visual outcome associated with open globe injuries as shown by Archana etal in New Zealand and Bonaana etal in Ghana (Annex 1) more emphasis should be put on the prevention of such injuries.

Visual acuity in the injured eye at presentation was recorded in 398 (92.2%) of the injured eyes and not recorded in 34 (7.8%) which were mostly children below the age of 5 years. The majority 201 (46.5%) of eyes had normal visual acuity, 119 (27.6%) had some form of visual impairment and 78 (18.1%) eyes were blind at initial presentation according to the WHO classification of visual acuity in the injured eye [Table 2]. This is consistent with other studies in Ghana by Bonaana etal¹⁶ and in South Africa by Sukati etal⁶ where 18.7% and 29.2% were blind at initial presentation. This emphasizes the need to strengthen prevention strategies for ocular trauma as poor visual acuity at presentation has been shown to be associated with poor visual prognosis.¹¹ Only 3 (0.8%) patients were blind in both eyes according to the WHO classification, in these 3 patients only one eye was blind due to ocular

injury, in one patient the non-injured eye had end stage glaucoma and for the other two patients the non –injured eyes had cataract.

In this study looking at ocular findings at initial presentation conjunctival lesions (which included conjunctival laceration, FB, chemosis, subconjunctival haemorrhage) were the commonest 92 (21.3%) finding, followed by lid contusions 84 (19.4%) and corneal FB and ulcers 78 (18.1%), [Table 3]. This is similar to findings in a study in South-South Nigeria where conjunctival lesions were the most common finding at 38.6% ¹⁴ whilst in a study done in Western Nigeria corneal injuries were the commonest (43.9%).²¹

Majority, 331 (83%) of ocular trauma patients were seen without a referral and only 68 (17%) were referred from other health facilities [Figure 12], this is explained by the fact that MGH is the only government facility with an equipped eye unit and a resident ophthalmologist. This is similar to findings by Bonsaana et al in Ghana and Funjika et al in KNH Kenya where the majority of patients were seen without referrals 68.42% and 59.3% respectively.^{16, 13}

In our study the majority of patients 245 (61.4%) presented within 24 hours of injury, followed by 60 (15.0%) who presented within 2days [figure 13], with a median (IQR) of 1.0 (0-2.0). This finding is higher than what has been found in most African countries as seen in a study done in South –South Nigeria where only 37.9 % presented within 24 hours of injury¹⁴ and in a study by Momanyi et al at MTRH Kenya where they found that 30.7% presented within one day of injury.¹⁵ The higher numbers in presentation within 24 hours in this study is attributed to that there is a free ambulance service in the country to take people to hospital in cases of emergencies.

One hundred and twenty-seven, 127 (88.19%) of the 144 admitted patients needed surgery [Figure 14], 47 (37.0%) had surgery on the same day of admission and a most 67 (52.8%) waited one day before surgery done, this finding is similar to that of a study in KNH in Kenya where 54.2% waited one day before theatre was available.¹³ For 2 of the 3 patients that had to wait >3-7 days after admission to go to theatre it was because the only ophthalmic surgeon in the hospital was on leave. The duration between admission and getting theatre space can be reduced if the eye unit were to be provided with its own theatre.

The most common intervention for patients in this study was medical treatment alone 216 (50.0%), followed by lid repair (11.1%), corneal FB removal (10.9 %), and corneal laceration repair 37 (8.6%) [Table 4]. This is similar to findings in a study done in Central Ethiopia where 66.8% of the patients were managed with medication only²² There were 2 patients seen in out-patient with corneo-scleral laceration and they were referred to the mission hospital where the only other ophthalmologist in the country is located because the resident ophthalmologist in the government facility was on leave.

Depending on the severity of injuries a combination of surgical procedures were done, including corneal, scleral and corneo-scleral laceration repair, AC washout with or without lens washout and anterior vitrectomy. Of the fifteen (15) eyes with ruptured globe, 11 were severely damaged and were eviscerated the other 4 were repaired, of which 3 underwent phthisis. Of the two (2) patients who had endophthalmitis one was eviscerated and the other received intravitreal antibiotics and eye underwent phthisis. Four (4) patients had orbital cellulitis and 1 developed a lid abscess and had an incision and drainage done. The other 3 were managed on intravenous antibiotics. Six (6) patients in the study had vitreous haemorrhage and those who had associated open globe injuries were managed for them and referred to RSA for vitrectomy. There were two (2) patients had intra-orbital FB and they both had orbitotomy and fb removal done, vision remained good for these patients.

Follow up pattern over 6 month's period showed that follow up was high in the first two (2) weeks with 137 (95.1%) of those seen as in-patients and 219 (85.9%) of those seen in out-patient coming for review [figure 15]. After that there was a quick decline in follow up in those seen in outpatients, a finding consistent to that found by Momanyi et al of a high loss to follow up especially with the out-patient clientele¹⁵ and findings by Bonaana et al who found that patients with monocular blindness following trauma were more likely to come for follow up compared to those with normal vision ($p < 0.01$)¹⁶. This loss in follow up may be due to that most patients seen as outpatients had minor injuries associated with normal visual acuity, recovered quickly and needed no further management, whilst patients with severe visual loss after trauma are more likely to come for follow up. Some patients may have decided to continue follow up at local health facilities due to financial constraints.

Looking at the visual acuity over a 6 month follow up period in this study there was improvement in visual acuity over the first 2 weeks of follow up with increase in eyes with normal visual acuity (6/6-<6/18) increasing from 46.5% at presentation to 66.1% at the 2 week review and patients with vision \leq 3/60 reducing from 18.1% to 13.2% [Table 5] Though 36.6% of the patients were still blind according to WHO classification on the injured eye at the 6 month follow up, there was a statistically significant improvement in visual acuity at presentation and last follow up ($p < 0.001$). This is consistent with other studies that have shown that open globe injuries have a poor visual prognosis.^{20, 11} At 6 months follow up closed globe injuries had a better visual prognosis compared to open globe injuries [Figures 16 & 17]. For 82 eyes that were present for all follow up visits [Table 6], there was a statistically significant improvement in VA at 6 months, whilst open globe injuries showed a poor visual prognosis for the same period [figure 18] closed globe injuries had a better visual prognosis [figure 19].

The majority 344 (79.6%) of traumatised eyes did not have complications due to the ocular trauma at their last follow up, only 88 (20.37%) had complications reported at last follow up [Figure 20]. The most commonly seen complication was corneal scar 39 (9.0%) followed by refractive error 24 (5.6%) and phthisis bulbi 8 (1.8%). The Refractive errors could be attributed to astigmatism either post corneal repair, aphakia or may have been present prior to the injury. These findings are consistent with those of Bonsaana et al in Ghana where corneal opacity was 10.6%¹⁶ and Momanyi et al in MTRH Kenya who found corneal opacities accounted for 16.7% of their complications¹⁵

5.1 Conclusion

- a. Ocular trauma accounts for 10.9% of the patients seen in the MGH eye unit.
- b. Ocular trauma is 3.1 times higher in males than females. The most predisposed are the economically active age groups 21-39 followed by age group 10-19 years. Home and workplace were the most common places of occurrence of trauma while organic objects were the most common agent causing of trauma. Most ocular trauma was accidental and closed globe injuries were more than open globe injuries. About one fifth were blind in affected eye at presentation.
- c. A majority of patients were seen in MGH without referral. Most presented within the first day of injury. The most common intervention was medical treatment alone followed by lid repair. The majority of patients who needed surgical intervention were operated on within 48 hours of admission.
- d. There was a high loss to follow up for patients with normal visual acuity. Though there was a significant improvement in visual acuity ($p < 0.001$) at last follow up, open globe injuries were associated with a poor visual prognosis. Whilst the majority of eyes did not have complications the most recorded complication recorded was corneal opacity.

5.2 Recommendations

- a.** There is need for improved documentation of all relevant patient information including that pertaining to injury itself, and record keeping from presentation to follow up. This will help in patient management, medicolegal purposes, compensation claims and research. A form can be designed so that all the relevant information is recorded.

- b.** There is a need for prevention strategies to target young people (including students) and males, by promoting public awareness on prevention of ocular trauma and emphasizing the use of protective eyewear in the workplace and at home during DIY activities. There is a need to also involve those responsible for children sporting activities in schools and general care of children on importance of supervised sport and play.

- c.** There is need to train more ophthalmologist (including sub specialist training) and training of ophthalmic support staff (i.e. ophthalmic nurses and optometrist) for the countries government hospitals and health facilities. This will help with efficient management of patients because with early specialist intervention visual outcomes can be improved. This can also improve follow up of patients by bringing services closer to the patient's communities.

5.3 Study Limitations

- a.** This is a Hospital based study and not a true representation of the population at risk, as some of the minor ocular trauma injuries do not get to come to come to MGH.

- b.** Missing data such that certain variables could not be analysed.

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TIME LINES

ACTIVITIES	SEP – DEC 2015	JAN – APR 2016	MAY- JUN 2016	JULY – AUG 2016	SEP – OCT 2016	NOV – DEC 2016	JAN – MAR 2017	APRIL-MAY 2017	JUNE- JULY 2017
Proposal development									
Research and Ethical Committee approval									
Data collection									
Data analysis									
Report writing									
Dissemination of findings									

APPENDICES

Appendix I: Questionnaire

Prevalence, Pattern and Outcome of Ocular Trauma in MGH, Swaziland

Patient Number:

--	--	--	--	--

File/folder number will be in a separate confidential record, matched with the serial/code number.

DEMOGRAPHIC DATA

SEX: M/F AGE (yrs.)..... OCCUPATION. RESIDENT//NON RESIDENT

HISTORY

DATE OF INJURY: .../.../... DATE OF FIRST PRESENTATION: .../.../...

IF REFERRED

Source of Referral: Referral diagnosis.....

No of Days before Presentation at MGH:

First treatment before attending MGH:

DATE OF ADMISSION: /.... /....

PAST OCULAR DISEASE:

Eye Injured: RE / LE / BE

Accidental / Non Accidental

Object of trauma

Place of injury.....

EXAMINATION

GENERAL SIGNS AT PRESENTATION

Fever: Yes/No Other significant non ocular findings relating to trauma: Yes/No

If yes, please specify

OCULAR FINDINGS AT PRESENTATION

PRESENTING VA: Yes / No *if yes* RE..... LE.....

IOP (mmHg): Yes / No *if yes* RE LE

OCULAR ADNEXA	RE	LE
Lids (laceration, fb, avulsion etc.)		
Proptosis		
Dystopia		
Orbit (fracture)		
Globe (rupture)		
Anterior & Posterior Segment		
Conjunctiva		
Cornea		
Sclera		
Anterior Chamber (Hyphaema, hypopion, vitreous, lens)		
Iris (prolapse, iridodialysis)		
Lens (cataract, dislocated, etc.)		
Vitreous (haemorrhage)		
Retina		
Endophthalmitis		
IOFB		

INVESTIGATIONS

None:

.....

Skull/ orbit X-ray.....

CT scan

Vitreous tap

Blood culture

Other, please specify

TREATMENT GIVEN

	MEDICAL ONLY	SURGICAL+ MEDICAL
RE		
LE		

If surgery was done:

No. of days waiting for surgery:

Type of surgical procedure:

.....

Subsequent surgery needed: Yes/No

If yes specify type of subsequent surgery

Medical treatment:

POST TREATMENT COMPLICATIONS

Duration:

RE:.....

LE:

VISUAL ACUITY AT FOLLOW-UP

Last follow-up

EYE	NO	YES	
		Snellen Chart/ Lea Chart	Log mar Conversion
RE			
LE			

THANK YOU

Appendix II: WHO Classification of Blindness

Categories	Degree of visual impairment	Best corrected visual acuity in the better eye
0	Normal vision	6/6 – 6/18
1	Visual impairment	< 6/18 -6/60
2	Severe visual impairment	< 6/60 -3/60 or visual field < 10°
3	Blind	< 3/60 – NPL or visual field < 5°

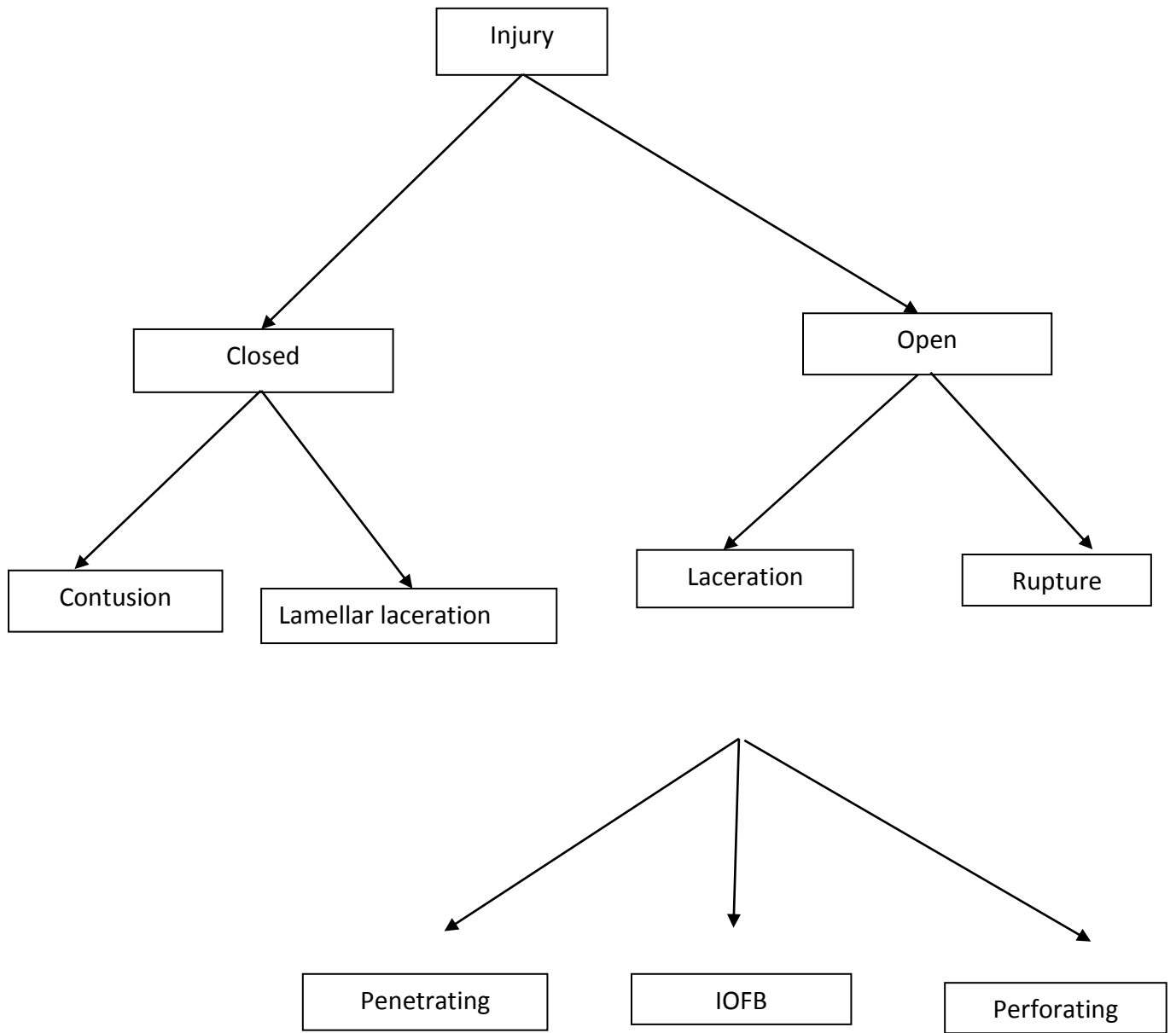
Appendix III: Conversion Table of Snellen Visual Acuity to Logmar

Snellen visual acuity	Logmar
6/6	0
6/9	0.176
6/12	0.301
6/18	0.477
6/24	0.602
6/36	0.778
6/60	1

Appendix IV: Ocular Trauma Classification, Terminology, Definition and Explanation

- **Eyewall:** sclera and cornea, though the eyewall anatomically has 3 layers posterior to the limbus, for clinical and practical purposes, violation of only the most external structures of the eyewall is considered.
- **Closed globe injury:** No full-thickness wound of the eyewall. The cornea and sclera are not breached through and through.
- **Open globe injury:** Presence of full-thickness wound of eyewall. The cornea and /or sclera are breeched through and through.
- **Contusion:** No obvious wound on eyewall, the injury may be due to direct energy delivered by the object (e.g., choroidal rupture) or maybe due to changes in the shape of the globe (e.g., angle recession).
- **Lamellar laceration:** Partial thickness wound of the eyewall, not thorough and through.
- **Rupture:** full-thickness wound of the eyewall due to a blunt object, which causes an instant increase in IOP because the eye is filled with an incompressible liquid. Thus the eye gives way at its weakest point (usually not at the impact site); the actual wound is produced by an inside-out mechanism that will almost unavoidably cause tissue prolapse.
- **Laceration:** full-thickness wound of the eyewall caused by a sharp object. The wound occurs at the impact site by an outside-in mechanism.
- **Penetrating injury:** has an entrance wound. If more than one wound is present, then each has been caused by a different object.
- **Retained intraocular foreign body:** one or more foreign objects are present, is primarily, a penetrating injury, but due to its different clinical implications, it is grouped separately.
- **Perforating injury:** has both an entrance and exit wound and both wounds have been caused by the same object.

In cases of multiple wounds or if there is difficulty in classification one can describe them as ‘mixed’ or select the most serious type of mechanism involved.



Appendix V: Ethical Approval



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KENYATTA NATIONAL HOSPITAL
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Ref: KNH-ERC/A/187

6th June, 2016

Dr. Zwane Tholakele Fortunate
Reg. No.H58/74631/2014
Dept. of Ophthalmology
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Zwane

REVISED RESEARCH PROPOSAL- A 2 YEAR RETROSPECTIVE STUDY ON PREVALENCE, PATTERN AND OUTCOME OF OCULAR TRAUMA IN MBABANE GOVERNMENT REFERRAL HOSPITAL, ZWAZILAND (P5/01/2016)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above proposal. The approval period is from 6th June 2016 – 5th June 2017.

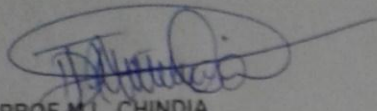
This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.
- Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to Discover

Yours sincerely,



PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
 The Deputy Director, CS, KNH
 The Assistant Director, Health Information, KNH
 The Chair, KNH- UoN ERC
 The Dean, School of Medicine, UoN
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MINISTRY OF HEALTH
P.O. BOX 5
MBABANE
SWAZILAND

THE KINGDOM OF SWAZILAND

30TH June, 2016

Dr. Tholakele Zwane
Principal Investigator
MBABANE

REF: MH/599C/FWA 000 15267/ IRB 000 9688

Dear Dr. Zwane,

RE: A TWO YEAR RETROSPECTIVE STUDY ON THE PREVALENCE, PATTERN AND OUTCOME OF OCULAR TRAUMA IN MBABANE GOVERNMENT HOSPITAL, SWAZILAND.

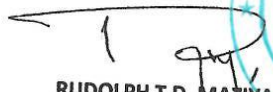
The committee thanks you for your submission to the Swaziland Scientific and Ethics Committee, an expedited review was conducted.

In view of the importance of the study and the fact that the study is in accordance with ethical and scientific standards, the committee grants you authority to conduct the study. You are requested to adhere to the specific topic and inform the committee through the chairperson of any changes that might occur in the duration of the study which are not in this present arrangement.

The committee requests that you ensure that you submit the findings of this study (Electronic and hard copy) and the data set to the Secretariat of the SEC committee.

The committee further requests that you add the SEC secretariat as a point of contact if there are any questions about the study on 24040865/24044905.

Yours Sincerely,


RUDOLPH T.D. MAZIYA
THE CHAIRMAN, SEC
cc: SEC members



Annex I

Country	n	prevalence	M:F	Mean Age/ common Age Group	Place of trauma	Common Object of trauma	Type of Globe Injury	Circumstance of trauma	Reference
Scotland	415	8.14 per 100,000	-----	-----	Home (52%) work- place (24%)	-----	-----		4. Desai P et al Incidence of cases of ocular trauma admitted to hospital and incidence of blinding outcome. <i>Community Eye Heal J.</i> 1997; 10(24):62–3.
Scotland Nov 91 –Oct 92	428	-----	-----	-----	Home (30.2%)	Tools or machinery 24.2%	CGI 54.4%	Accidental 78.2%	8. Desai P, MacEwen CJ, Baines P, Minassian DC. Epidemiology and implications of ocular trauma admitted to hospital in Scotland. <i>J Epidemiol Community Heal</i> 1996; 50(4):436–41.
New Zealand Jan 99 –Dec 2008	821	20.5%	2.8:1	16-30 years 22.8%	Out-doors 25.9% Work 20.7%	-----	CGI >69%	Accidental 90.8%	20. Pandita A, Merriman M. Ocular trauma epidemiology: 10-year retrospective study. <i>N Z Med J.</i> 2012; 125(1348): 61–9.

Annex I

Country	n	prevalence	M:F	Mean Age/ common Age Group	Place of trauma	Common Object of trauma	Type of Globe Injury	Circumstance of trauma	References
Pakistan Jan – Dec 2013	280	1.016%	8.3:1	11-30 years (67.1%)	-----	Sharp object (71.4%)	-----	Accidental (75.72%)	19. Muhammed AP, Kanwal K, Rasheed A. Ocular Injuries - An experience at Anwar Paracha Eye Hospital Sukkur. Medical Forum Monthly
China 2001 -2010	3559	-----	5.2:1	Male 15 -44 (56.2%) Female 0-14 (36.0%)	Work (46.5%) Home (20.1%)	Metal (53.3%)	OGI (55.1%)	Accidental (86%)	11. Cao H, Li L, Zhang M. Epidemiology of Patients Hospitalized for Ocular Trauma in the Chaoshan Region of China, 2001-2010. <i>PLoS One</i> . 2012; 7(10):1–7.
India Feb 2011- Jan 2012	165	1.03%	10:1	< 30years (56.6%)	Road (32.7%)	Wooden stick (16.7%)	OGI 45.5%	Accidental > 90%	12. Titiyal GS, Prakash C, Gupta S, Joshi V. Pattern of ocular trauma in tertiary care hospital of kumaon region, Uttarakhand. <i>J Indian Acad Forensic Med</i> . 2013;35(2):116–9

Annex I

Country	N	prevalence	M:F	Mean Age/ common Age Group	Place of trauma	Common Object of trauma	Type of Globe Injury	Circumstance of trauma	Reference
Ethiopia Nov 09 - Oct 10	753	5%	3:1	15-30 years	Home, farm, street	Blunt object i.e. stick, wood		Accidental (77.6%)	22. Addisu Z. Pattern of ocular trauma seen in Grarbet Hospital, Butajira, central Ethiopia. <i>Ethiop J Heal Dev.</i> 2011; 25(2):150–5.
Kenya (KNH) Jan 2005 – Dec 2009	265	-----	7.2:1	21-30 years (46%)	-----	Metal (36.9%)	OGI 90.6%	Accidental (54.3%)	13. Funjika M, Gichuhi S, Marco S. <i>A review of Eye injuries in adults hospitalised at Kenyatta National Hospital (KNH) Eye ward.</i> Dissertation MMed Ophth. University of Nairobi; 2011.
Kenya (MTRH) Jan 2005 -Dec 09	524	-----	2.5:1	21-30 years	Home (30.7%)	Sticks (30.6%)	OGI (70%)	-----	15. Momanyi C, Njuguna MW, Gichuhi S, Wanjala I. <i>Pattern and outcomes of Ocular trauma in patients seen at Moi Teaching and Referral Hospital.</i> Dissertation MMed Ophth. University of Nairobi 2011.

Country	n	prevalence	M:F	Mean Age/ common Age Group	Place of trauma	Common Object of trauma	Type of Globe Injury	Circumstance of trauma	Reference
Ghana Jan-Dec 2010	438	21.6%	1.8:1	20-29 (27.4%) 30-39 (21.1%)	Home (15.24%)	Organic (15.9%)	CGI (96.6%)	Accidental (43.7%) Un- recorded (48.5%)	18. Bonsaana GB, Nyenze EM, Ilako DR, Wanye S. Review of Ocular Trauma in Tamale Teaching Hospital, Tamale, Ghana. <i>J Ophthalmol East Cent South Africa</i> . 2015; 19(2):75-81.
Nigeria Jan 2008- Dec 2009	220	4.06%	1.6:1	21-50 (64.6%)	-----	-----	-----	Assault (62.2%)	14. Emem A, Uwemedimbuk E. Prevalence of Traumatic Ocular Injuries in a Teaching Hospital in South -South Nigeria- a Two Year Review. <i>Adv Trop Med Pub Heal Int</i> . 2012; 2(3):102-8.
Nigeria Jan - Dec 2009	132	-----	----- -	-----	Home 1/3	Vegetative 42.4%	CGI 84.1%	-----	21. Omolase CO, Omolade EO, Ongunleye OT, etal Pattern of ocular injuries in OWO, Nigeria. <i>J Ophthalmic Vis Res</i> 2011;6(2):114-118
South Africa Jan 2005 - Dec 2008	440	-----	2.2:1	21-30 (31.4%) 31-40 (20.9%) 0-12 (12.7%)	Home 54.5%	Solid object (metal pipes, planks) 53.4%	OGI 56.1%	Accidental 71.8%	6. Sukati V, Hansraj R. A retrospective analysis of eye injuries in rural KwaZulu-Natal, South Africa. <i>S Afr Optom</i> . 2012; 71(4):159-65.

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