

# **REVIEW OF OCULAR TRAUMA IN TAMALE TEACHING HOSPITAL, TAMALE, GHANA**

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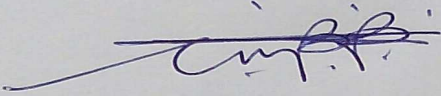
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DEGREE OF MASTERS IN MEDICINE (OPHTHALMOLOGY), UNIVERSITY OF  
NAIROBI**

## DECLARATION

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

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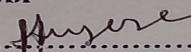
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## APPROVAL

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## **DEDICATION**

This work is dedicated to my wife, Patience; and my son, Batioka Junior; for their love, support and encouragement.

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

AC	Anterior Chamber
AV	Anterior Vitrectomy
BCVA	Best Corrected Visual Acuity
BJO	British Journal of Ophthalmology
DALYs	Disability Adjusted Life Years
DOA	Date of Admission
DOD	Date of Discharge
ERC	Ethics and Research Committee
FFL	Fixating and Following Light
FFO	Fixating and Following Object
GHC	Ghanaian Cedi
GHS	Ghana Health Service
GMJ	Ghana Medical Journal
GSS	Ghana Statistical Service
IM	Intramuscular
Ip No.	In-patient Number
IOL	Intraocular Lens
IOFB	Intraocular Foreign Body
KNH	Kenyatta National Hospital
KSh	Kenya Shilling
LE	Left Eye
NFL	Not Following Light
NPL	No Perception of Light

N/R	Northern Region
Op No.	Out-patient Number
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
TTH	Tamale Teaching Hospital
UON	University of Nairobi
USD	United States Dollar
WHO	World Health Organisation

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## ABSTRACT

**Objective:** The objective of this study was to establish the epidemiologic characteristics, referral pattern, interventions, visual outcomes and complications of ocular trauma in Tamale Teaching Hospital (TTH) Eye Clinic, Tamale, Ghana.

**Methods and materials:** This was a retrospective hospital-based case series in which all new patients of all ages with various eye conditions from 1<sup>st</sup> January to 31<sup>st</sup> December 2010 were reviewed from the outpatient/ inpatient record books and the sex and age recorded. The files/ folders of patients with ocular trauma were consecutively selected and retrieved. The epidemiological characteristics, referral pattern, interventions, visual outcomes and complications of ocular trauma were reviewed. The relevant data was extracted and a structured questionnaire completed for each patient. The data was then exported into STATA version 12 (Stata Corp, College Station, Texas) and analyzed. Significant differences and associations were determined by p-values of less than 0.05.

**Results:** A total of 2,027 records of new patients with various eye conditions were retrieved. Three hundred and sixty one (377 eyes) new ocular trauma patients' files/ folders were analyzed. The Male: Female ratio was 1:1.1 ( $p=0.09$ ) for all new patients with various eye conditions whilst it was 1.8:1 ( $p<0.01$ ) for new ocular trauma patients. Majority, 474 (23.38%), of new patients with various eye conditions were older than 49 years whilst most ocular trauma patients, 99 (27.42%), were in the age group of 20 – 29 years. Most, 247 (68.42%), ocular trauma patients were seen at TTH without a referral. Conjunctival lesions were the commonest, 144 (38.20%), finding in traumatized eyes at presentation. The commonest, 243 (64.46%), intervention rendered was medical treatment alone. By the WHO classification, the majority, 227 (67.36%), of traumatized eyes had normal vision, 47 (13.95%) were monocularly visually impaired and 63 (18.42%) were monocularly blind immediately after sustaining ocular trauma. Most, 337 (89.39%), traumatized eyes had no complications following ocular trauma. Forty (10.61%) eyes had complications of which corneal opacities/ scars were the commonest, 16 (4.24%).

**Conclusion:** Ocular trauma was a relatively common health problem especially among males in the economically active age group and a significant cause of monocular visual impairment/ blindness in TTH, Tamale, Ghana. Public awareness campaign on preventive measures need to be instituted to reduce the incidence and debilitating effects of ocular trauma as it has the potential of increasing the incidence of poverty in the community and the country as a whole because visual impairment/ blindness from ocular trauma has the potential to reduce ones productivity and that of the family as a whole since most affected persons turn to be the breadwinner of their families.

## **1.0 INTRODUCTION**

### **1.1 DEFINITION OF OCULAR TRAUMA**

Ocular trauma can be defined as any injury to the eyeball, adnexa, orbital and/or periorbital tissues. It can be classified into closed globe injuries (contusions and lamellar lacerations), open globe injuries (globe rupture, penetrating injury, intraocular foreign bodies and perforations) and adnexal injuries. It may be due to direct contact with fixed or mobile object, blunt or sharp object, hot object, chemical substances, electrical power sources or radiation.<sup>1, 2</sup>

### **1.2 BACKGROUND**

Ocular trauma is an important preventable cause of visual impairment and monocular blindness globally. Owens et al (2011) carried out a statistical brief in the United States of America (USA) that compiled information from the Healthcare Cost and Utilization Project (HCUP) on Emergency Department (ED) visits related to eye injuries in 2008. There were about 636,619 ED visits related to eye injuries, a rate of 209 visits per 100,000 populations. About 3.1 percent of patients seen in the ED for eye injuries were admitted to the hospital— compared to 8.1 percent of ED visits for all other types of injuries.<sup>3</sup> In a ten-year retrospective study done in New Zealand, the annual rate of ocular trauma was 20.5 per 100,000 populations<sup>4</sup>. In the Singapore Indian Eye Study, ocular trauma was reported in 5.1% of the study population, of whom 26.5% required hospitalization.<sup>5</sup> Cao et al in China estimated that the annual incidence rate of hospitalized eye injury was 27.7 per 100,000.<sup>6</sup> Ocular trauma accounted for 165 patients (1.03%) of 15,970 ocular patients seen at an Out Patient Department and Emergency in India.<sup>7</sup> Trauma to the eye is an important cause of visual impairment and monocular blindness. Trauma-related causes of visual impairment were corneal scars (80.0%, 4 eyes) and macula scar (20.0%, 1 eye). Whilst the trauma-related causes of blindness included corneal scars (30.0%, 3 eyes), phthisis bulbi (20.0%, 2 eyes), macular scar (30.0%, 3 eyes), and optic atrophy (20.0%, 2 eyes) as found in the Singapore Indian Eye Study.<sup>5</sup> In 2012, there was a reduction in visual acuity of 37.7% of subjects following treatment after ocular trauma in South Africa.<sup>8</sup> A retrospective case series done in Kenya (2011) showed that most injured eyes (81.5%) were blind at admission and 63.8% were blind at discharge.<sup>9</sup>

In Africa, few studies have been published on ocular trauma. In a two year review of 5,416 patients, 220 (4.06%) had at least one form of ocular trauma or the other in Nigeria<sup>10</sup>. In another study in Nigeria, 1,508 new patients were seen out of which 149 presented with monocular blindness, giving an incidence of 9.9%. Very few studies have been done in Ghana on ocular trauma especially in the last five years. In a retrospective case series, Gyasi et al found that ocular injuries (23.2%) were the second most common cause of destructive eye procedures.<sup>11</sup> Eye injuries are a serious burden economically. Ocular trauma is an important cause of visual loss and is frequently preventable.<sup>4</sup> Even though there is high coverage of national health insurance scheme in Ghana; most patients still do not have health insurance and have to pay from their pockets to access health hence the need for preventive measures. This study will establish the epidemiologic characteristics and burden of ocular trauma and will be of help in revising or

formulating appropriate legislation on safety and preventive measures against ocular trauma in Ghana.

## **2.0 LITERATURE REVIEW**

### **2.1 EPIDEMIOLOGY OF OCULAR TRAUMA**

Research indicates that young males are predominantly victims of ocular trauma with the majority under 30 years of age.<sup>3, 4, 5, 7, 9, 12</sup> A study in the USA in 2011 estimated that ED visits related to eye injuries were 1.7 times higher for males (262 visits per 100,000 populations) than females (158 visits per 100,000 populations). In comparison, ED visits for other types of injuries were only 1.2 times higher for males than females (10,400 versus 9,007 per 100,000 populations, respectively). Almost three-quarters of ED visits related to eye injuries were for patients 44 years and younger (73.6 percent).<sup>3</sup> In New Zealand (2012), it was found that the incidence of eye injury was seen to be decreasing with increasing age. The maximum number of injuries was seen in the age group 16-20 years and 26-30 years (11.5% and 11.3% respectively). Out of a total of 821 injuries, men had higher rate of ocular trauma than women (74% versus 26%,  $p < 0.001$ ). The mean age was 31 years for males and 37 years for females, respectively.<sup>4</sup> Malik et al (2012) in Pakistan estimated that the mean age of patients was 18.24 years with almost 70% of ocular trauma occurring in the first two decades of life. In the first decade, male: female ratio was 1.6:1 but it increased to 10:1 after the first decade.<sup>13</sup> Out of a total of 3,644 injured eyes from 3,559 patients over a 10-year period in China; the mean age of the patients was 29.0 $\pm$ 16.8 years with a male-to-female ratio of 5.2:1 ( $P=0.007$ ).<sup>6</sup> In South Africa (2012) it was estimated that more males (68.9%) had eye injuries than females (31.1%). Young patients between 21 and 30 years old incurred more ocular injuries (31.4%) than other age groups.<sup>8</sup> In Kenya (2011), Funjika et al found the male to female ratio to be 7.2:1, 87.9% and 12.1% respectively, and 68.6% were between the ages of 21-40 years and the mean age was 31.4 years.<sup>9</sup> Momanyi et al (2011) also found that 71% were males with a male to female ratio of 2.5:1 and the most common age group was 21-30 years, 28.4%.<sup>12</sup> There appears to be a predilection for the left eye to eye injuries,<sup>9, 12</sup> but in other studies the reverse is true.<sup>14, 15</sup>

Ocular trauma is common in the developing world and more so in the rural setting. Owens et al in the United States noted that there were more than 5 times as many ED visits related to eye injuries for patients from rural areas (646 per 100,000 population) than urban areas (120 per 100,000).<sup>3</sup> Occupation has been found to play a central role in the aetiology of ocular injury. In China, Cao et al found that most male patients (50.4%) who presented with ocular trauma were blue collar workers (physical laborers) under 44 years old, whereas the females (36.0%) were more likely to be children aged 14 years or younger.<sup>6</sup> Rafindadi et al (2013) retrospectively reviewed orbital and ocular trauma in which students (32.4%) were the majority, followed by skilled professionals (24.7%), and farmers (5.6%).<sup>16</sup> Eye injuries occur at a high rate among metal workers and welders. Flying metal chips were the chief source of ocular injury, as reported by 199 (68.15%) of those who gave a history of work-related eye injury in Nigeria.<sup>8</sup>

In New Zealand accidents were the main cause of eye loss in the decades prior to 1990. Medical conditions have been the main cause since. The decline of accidents resulting in eye loss is consistent with decreasing workplace and traffic accidents in the general population and may be

due to improved workplace safety standards, safer roads and better medical management.<sup>17</sup> Thus, preventive measures can be instituted to reduce the incidence and debilitating effects of ocular trauma based on epidemiological studies which are largely lacking in the developing world and Ghana is not an exception.

## **2.2 AETIOLOGICAL FACTORS OF OCULAR TRAUMA**

The cause of ocular trauma is strongly related to among other factors age, gender, occupation and the environment. In the USA (2011), common causes of eye-injury related ED visits included being struck by an object, falling, fires/burns, motor vehicle traffic and environment causes. Among cases admitted to the hospital from the ED, falls were the most common cause followed by motor vehicle traffic accident and being struck by an object.<sup>3</sup> Pandita et al (2012) in a study in New Zealand revealed that the younger age group had assault and metal work as a main cause of ocular injuries. Elderly people had ocular injuries mainly from falls.<sup>4</sup> In China, the most frequent types of injury were work-related injuries (1,656, 46.5%) and home-related injuries (715, 20.1%).<sup>6</sup> A Hospital-based, prospective study in a rural area in India showed that the most common cause of circumstance in which injury occurred in adults was while undertaking agriculturally related work (43.33%). However, in the paediatric age group, most of the ocular injuries were sustained while at play (36.67%). It was also found that out of 19 patients with open globe injury; the commonest object causing injury was a wooden stick (21.05%), followed by a stone (15.79%) and a bull's horn (10.53%). The commonest object causing closed globe injury in 41 patients was a wooden stick (24.39%) followed by sugarcane leaf (19.51%).<sup>18</sup> But in an urban area still in India, the cause of injury were road traffic accidents, sports playing & recreational activities and occupational in 54(32.7%), 42(25.5%) and 33(20%), respectively.<sup>7</sup>

The home is a common place for ocular trauma in Africa, varying from 54.5% in South Africa,<sup>8</sup> through 42.3% in Nigeria<sup>16</sup> to 30.7% in Kenya.<sup>12</sup> In 2011 Funjika et al found that 25.3% of patients were self-employed and 24.2% were casual workers and the commonest cause of injury (36.9%) was metal. He estimated that 54.3% of the injuries were sustained in accidental circumstances while 45.7% were due to assaults.<sup>9</sup> However, Momanyi et al found that the second most common setting is the farm/workplace in 24.6% and sticks were the most common causative agent 30.6% followed by stones 12.2%. The median interval before hospital presentation was 3 days.<sup>12</sup> Meanwhile in Nigeria, vegetative materials were the most common (42.4%) offending agent, a minority of patients (22%) were admitted and none of the patients had used eye protection at the time of injury.<sup>19</sup> In another study in Nigeria, the most common cause of injury was assault in the form of slap/ fist blow/fight, 137(62.2%). Road traffic accident (RTA) was the second most common accounting for 45(20.5%) of the injury. Use of traditional eye medication (TEM) was responsible for 21(9.5%) cases. Occupational injury in the form of metal (wire, hammer, fan blade, rod) was seen in 13(5.9%), foreign body (saw dust) 2 (0.9%).<sup>10</sup>

Ocular trauma may be open or closed. Out of a total of 3,644 injured eyes from 3,559 patients over a 10-year period in China; there were 2,008 (55.1%) open-globe injuries, 1,580 (43.4%) closed-globe injuries, 41 (1.1%) chemical injuries, 15 (0.4%) thermal injuries and 678 (18.6%) ocular adnexal injuries.<sup>6</sup> In South Africa, open globe injuries were more frequent (56.1%) than closed globe injuries (43.9%).<sup>8</sup> Likewise in Kenya, open globe injuries accounted for 70% and closed globe injuries 30%.<sup>12</sup> Contrary to the above observations, a study in Nepal proved

otherwise. The commonest type of trauma was closed globe injury (73.3 %).<sup>20</sup> This is consistent with studies in New Zealand, where 253 open globe injuries (OGI) and 568 closed globe injuries (CGI) ( $p < 0.001$ ) were reported<sup>4</sup> and in India where a study showed that closed globe injury (68.33%) was more common than open globe injury (31.67%).<sup>18</sup>

In the Singapore eye study, a total of 42.0% of cases resulted from a blunt object, 36.4% from a sharp object, and 15.4% from chemical burns.<sup>5</sup> In yet another study, one hundred and seventeen (68%) patients had injury following blunt trauma and remaining 55 (32.0%) had laceration.<sup>14</sup> On review of the causes of ocular trauma in Nepal, blunt trauma accounted for 56.5%, the commonest of all, followed by sharp injury accounting for 16.7 %.<sup>20</sup> In South Africa, Blunt trauma/contusion (36.4%) was the most frequent type of injury. Solid objects (53.4%) were responsible for more than half of the injuries followed by assaults (28.2%).<sup>8</sup> In Nigeria, Mild blunt trauma (49.3%) was the most common diagnosis, followed by severe blunt trauma (30.3%). Severe and mild penetrating injury occurred in 16.2% and 4.2% of the patients respectively.<sup>16</sup> Still in Nigeria, of 132 patients included in a study, most 84.1% sustained blunt eye injury while 12.1% had penetrating eye injury.<sup>19</sup>

Sport is emerging as an important cause of ocular trauma. Out of a total of 3,206 patients hospitalized in Belgrade (2013) for serious mechanical injuries, 117 (3.6%) patients sustained their eye injuries during some sport activities. All but 3 injured were males; 2 girls had their eyes injured by tennis ball and the third girl was injured while playing the handball. The right eye was wounded in 70 (59.8%) cases. There was no patient with simultaneous injuries of both eyes. In general, the injuries occurred in children and younger adults, and none after the age of fifty. Mean age of the injured was 25.8 years. Closed injuries were reported in 113 (96.6%) patients and open injuries were evident in the remaining 4 (3.4%) cases. In closed bulbar injuries, there were different damages of the intraocular structures, and in open injuries two cases manifested penetrating injuries and two other cases had rupture of the eye ball. The majority of injuries occurred in recreational sport activities—76.1%, followed by school—19.6% and in professional sports—only 4.3%.<sup>15</sup>

Alcohol consumption has been found to significantly increase the risk of ocular trauma. Han et al (2011) Korea, retrospectively reviewed the medical records of 1,024 patients who visited emergency department and received ophthalmologic examination. The patients consisted of 2 groups: those with ocular trauma ( $n = 494$ ) and those without ( $n = 530$ ); the influence of alcohol consumption was compared between these 2 groups. In the ocular trauma group, the association of the causes and types of ocular trauma with alcohol consumption was evaluated. It was found that one of 530 patients of no trauma group and 117 (23.7%) of 494 patients of trauma group were related with alcohol intake ( $P < 0.001$ ). Concerning the causes, physical assault was significantly more common in alcohol- associated injury ( $P < 0.001$ ). Regarding the types of injury, orbital wall fracture and hyphaema showed a significant association with alcohol consumption ( $P < 0.001$ ). Older age and nighttime injury were significantly related to the increased risk of alcohol- associated ocular trauma ( $P = 0.018$  and  $< 0.001$ , respectively).<sup>21</sup>

## **2.3 CLASSIFICATION OF OCULAR TRAUMA**

Ocular trauma may be classified broadly as follows;

1. Closed globe injuries (ocular surface foreign bodies, contusions and lamellar lacerations)



2. Open globe injuries (globe rupture, penetrating injury, intraocular foreign bodies and perforations)
3. Orbital, adnexal or Cranial nerve trauma

### **2.3.1 Closed Globe Trauma**

Closed globe injuries include; ocular surface foreign bodies, contusions and lamellar lacerations. A closed globe/blunt trauma occurs when there is a direct blow to the eye. The consequence of such a trauma ranges from a simple 'black eye' to severe intraocular disruption. Contusions and/or tears occurs when there is blunt trauma to the eye, this is due to anterior-posterior compression and corresponding equatorial stretching of the globe. Hyphaema is usually due to bleeding from the iris and/or ciliary body which are highly vascularised. Damage to the lens may subluxate or dislocate it. It may also result in cataract and /or phacomorphic or phacoanaphylactic uveitis or pupillary block glaucoma. Angle recession glaucoma may also occur due to damage to the trabecular meshwork. Stretching of the vascular choroid can lead to choroidal rupture in the posterior segment. This appears as subretinal haemorrhage and gradually clears to reveal an arcuate choroidal scar. Loss of central acuity occurs due to Berlin's oedema in most cases because of predilection for the macular area, whilst commotio retina may occur in other parts of the retina. Vitreous haemorrhage or retinal tears, breaks or detachment may also occur.<sup>1, 2</sup>

### **2.3.2 Open globe Trauma**

Open globe injuries include; globe rupture, penetrating injury, intraocular foreign bodies and perforations. A severe blunt trauma can lead to a full thickness globe rupture at the limbus and under the insertion of rectus muscles anteriorly and posteriorly around the entrance of the optic nerve, as they represent the weakest sites of the globe. This is due to anterior-posterior compression and corresponding equatorial stretching of the globe.<sup>1, 2</sup>

The extent of damage in penetrating trauma largely depends on where and how far the object enters the eye. However, they have poorer prognosis overall compared to blunt trauma. Small injuries that are off the visual axis and involve only the cornea may be self-sealing with insignificant visual morbidity. In some cases the iris plugs the wound leading to an irregular pupil. Lens opacity may result in an anterior segment penetrating trauma involving the anterior capsule of the lens. The retina is involved in posterior segment penetrating trauma. This may lead to the development of vitro retinal scarring and traction leading to complex retinal detachments after the injury.<sup>1, 2</sup>

Intra-ocular foreign bodies (IOFB): Damage to intra-ocular tissues by a foreign body is caused by virtue of its pathway into the eye and/or by toxicity to tissues as they degrade or oxidize if not removed early enough. Sterile plastic and glass are well tolerated in the eye because they are inert. Brass, bronze and gold are moderately tolerated whilst ferrous containing metals and copper cause severe reaction leading to siderosis and calchosis, respectively. Vegetable matter and stones are poorly tolerated and can cause severe endophthalmitis if not managed

immediately.<sup>1,2</sup> In Pakistan (2012) Intraocular foreign bodies (IOFB) were found in 75 (15%) of patients with ocular trauma,<sup>13</sup> however, in Kenya (2011) it was recorded in 11 (4.2%) patients.<sup>9</sup>

### **2.3.3 Orbital, adnexal or Cranial nerve trauma**

Orbital trauma may cause eye lid oedema, haematoma and/ or laceration/ loss involving the lid margin or lacrimal apparatus. There may also be damage to cranial nerves leading to palsies affecting vision, ocular motility or function of eyelids. A retrobulbar haematoma is a true emergency that must be evacuated urgently to prevent loss of vision. Bony orbital wall fractures may also occur with the floor being the commonest side often leading to a blow-out fracture or base of skull fracture.

## **2.4 PRESENTATION AND THE OCULAR TRAUMA PATIENT**

The clinical presentation of ocular trauma is diverse. There appears to be a predilection for the left eye to eye injuries,<sup>9, 12</sup> but in other studies the reverse is true.<sup>14, 15</sup> Most bilateral injuries are due to chemical insults or sharp objects.<sup>1, 2</sup> In India (2013) majority of patients presented with only anterior segment involvement (86.67%). None had isolated posterior segment involvement. Both anterior as well as posterior segment involvement was seen in 13.33% of patients.<sup>18</sup> In Nigeria, Mild blunt trauma (49.3%) was the most common presentation, followed by severe blunt trauma (30.3%). Severe and mild penetrating injury occurred in 16.2% and 4.2% of the patients respectively.<sup>16</sup>

Research suggests that people in the most productive age group (21- 50years) were most affected (64.6%), followed by children age group (0-10). Lid /conjunctival injuries were most common 85 (38.6%), followed by those with multiple structure injuries 40(17.7%). Those who had a history of trauma but no injuries sustained were 56(25.5%). Other injuries included; penetrating eye injury 9 (4.1%), hyphaema/ painful blind eye following trauma 8 (3.6%) while corneoscleral rupture with uveal prolapsed was 6 (2.7%), ocular nerve injury with strabismus 3 (1.4%), and retinal detachment 1 (0.5%).<sup>10</sup> In Kenya, most patients presented with corneal (64%) and scleral (45.3%) injuries.<sup>9</sup>

## **2.5 INVESTIGATION OF THE OCULAR TRAUMA PATIENT**

In most cases of ocular trauma computed tomography scan is enough and it is the modality of choice in acute setting where a ferrous containing/ metallic foreign body or fractures are suspected. Magnetic resonance imaging is good for vegetable matter orbital or intraocular foreign bodies and soft tissues. Ultrasound is good for intra-ocular lesions and orbital foreign bodies but limited by poor penetration. Plain X-ray is good for screening of fractures and orbital foreign bodies. It is also useful for assessment of the sinuses.<sup>1, 2, 22</sup>

## **2.6 COMPLICATIONS AND PROGNOSIS OF OCULAR TRAUMA**

Multiple complications can occur following eye injury<sup>9, 12</sup>. Ocular trauma is an important cause of visual impairment and monocular blindness. Trauma-related causes of visual impairment were corneal scars (80.0%, 4 eyes) and macula scar (20.0%, 1 eye). Whilst the trauma-related causes

of blindness included corneal scars (30.0%, 3 eyes), phthisis bulbi (20.0%, 2 eyes), macular scar (30.0%, 3 eyes), and optic atrophy (20.0%, 2 eyes) as found in the Singapore Indian Eye Study.<sup>5</sup> In 2012, there was a reduction in visual acuity of 37.7% of subjects following treatment after ocular trauma in South Africa.<sup>8</sup> A retrospective case series done in Kenya (2011) showed that most injured eyes (81.5%) were blind at admission and 66% were blind at discharge.<sup>9</sup> Two retrospective case series done in 2011 in Kenya showed corneal opacity to be the commonest complication.<sup>9,12</sup> IOFB such as ferrous containing metals and copper can cause severe reaction leading to siderosis and calchosis, respectively. Vegetable matter and stones are poorly tolerated and can cause severe endophthalmitis if not managed immediately.<sup>1,2</sup>

One can even lose one's eye due to ocular trauma. In China, 52 (1.4%) no light perception (NLP) eyes, enucleation was carried out for globe rupturing and uncontrolled endophthalmitis. In addition, 371 (10.3%) eyes with a canalicular fracture received anastomosis, and 56 (1.5%) orbital fracture repairs were performed due to significant enophthalmos and persistent diplopia.<sup>6</sup> Primary evisceration was done in 29 (12.1%) of patients with ocular trauma in Kenya and the commonest indication was a severely injured globe where repair was not possible. In four (13.8%) patients evisceration was done for endophthalmitis while in two cases it was due to necrotic tissue and panophthalmitis.<sup>9</sup> In Ghana, the second most common cause of destructive procedure of the eye was ocular injuries (23.2%), endophthalmitis /panophthalmitis (47.9%), was the first.<sup>11</sup>

## **2.7 MANAGEMENT OF THE PATIENT WITH OCULAR TRAUMA**

Immediate intervention is crucial to forestall further damage and possibly reverse any damage that had already occurred as in the case of say chemical burn where treatment should start at the accident site with copious irrigation of the eyes under running water. In the immediate period after the injury, the rapidity with which treatment is initiated may have an important effect on the final result. In the hospital setting management may start with detailed and relevant history taking followed by physical examination, performance of special investigations, treatment and follow up. Definitive treatment depends on one's clinical findings. This may include observation, medical and/or surgical. First aid before arrival at hospital as in chemical burns, tetanus toxoid injection in high risk injuries, antibiotic as prophylaxis in high risk cases, analgesics for pain, and application of eye shield/ pad to protect the globe may be instituted.<sup>1,2</sup>

A patient may be admitted in severe cases and in cases where compliance with treatment at home cannot be guaranteed. The type and extend of surgery that may be carried out depends on the nature of presentation of the patient and may range from lid laceration repair, foreign body removal, globe repair with abscission of prolapsed necrotic uvea, anterior vitrectomy, anterior chamber washout, lens washout with or without primary IOL implantation to conjunctival flap. Primary implantation of posterior chamber lenses after penetrating ocular trauma is associated with favourable visual outcome and a low rate of post-operative complications. However, this depends on the extent of damage and availability of facilities and may not always be possible.

Immediate and appropriate primary repair of scleral ruptures or lacerations is crucial to restore the normal anatomy of the globe and to prevent incarceration of the uveal tract or the vitreous in the wound. Secondary procedures may then follow to further repair and stabilize damaged intra-ocular structures if indicated.<sup>1, 2</sup> The commonest non-surgical treatment was antibiotics followed by analgesics,<sup>12</sup> whilst the commonest surgical treatment were corneal repair followed by scleral repair in studies done in Kenya.<sup>9</sup>

To detect any complications such as glaucoma, traumatic cataract and endophthalmitis in patients with ocular trauma, close follow up is needed. Unfortunately, many eye trauma patients are lost to follow up especially in the developing countries due to long distances they have to cover before they reach eye care centres, and the cost involved.<sup>9, 12</sup> A variety of secondary procedures and reconstructions could have been undertaken within the follow up period such as removal of corneal sutures, release of lid scars, surgery for traumatic cataracts, vitreo-retinal surgeries and corneal transplants in patients with scars.<sup>1, 2, 9, 12</sup>

## **2.8 KEY FACTORS AFFECTING VISUAL PROGNOSIS IN THE OCULAR TRAUMA PATIENT**

The key factors that correlate significantly with poor visual outcome following ocular trauma include;

- 1. Initial visual acuity:** The visual acuity at initial presentation has a direct correlation with the final visual outcome.<sup>9, 14, 23</sup>
- 2. Type of injury:** The visual outcome was poorer in open globe injury as compared to closed globe injury.<sup>18, 20</sup>
- 3. Location and extent of injury:** Irreversible damage to the retina and optic nerve may occur in posterior injury. Wound extending posterior to rectus insertion has poorer outcome compared to those limited anterior to rectus insertion.<sup>18, 23</sup>
- 4. Presence of a relative afferent papillary defect (RAPD):** RAPD was found to be strongly associated with poor visual outcome.<sup>14, 23</sup>
- 5. Lenticular involvement.**<sup>1, 2, 14, 23</sup>
- 6. Vitreous haemorrhage.**<sup>1, 2, 14, 23</sup>
- 7. Type of intra-ocular foreign body.**<sup>1, 2</sup>
- 8. Time at presentation after ocular injury:** Delayed repair is an important predictor of poor visual outcome.<sup>18</sup> In Nepal 52.9 % presented to the hospital within 24 hours,<sup>20</sup> only 32.5% did so in Kenya.<sup>9</sup>

### **3.0 JUSTIFICATION**

1. This study shall provide data on the epidemiologic characteristics and outcomes of ocular trauma as there is no published research on such a study in Tamale, Ghana.
2. This study may help to facilitate the provision of integrated eye care, formulation and enforcement of safety strategies for the prevention of ocular trauma in Tamale, Ghana.

### **4.0 STUDY OBJECTIVES**

#### **4.1 BROAD OBJECTIVE**

The main objective of this study was to determine the epidemiologic characteristics, referral pattern, interventions, visual outcomes and the complications of ocular trauma in Tamale Teaching Hospital, Ghana.

#### **4.2 SPECIFIC OBJECTIVES**

1. To establish the epidemiologic characteristics and referral pattern of ocular trauma patients.
2. To describe the interventions that were rendered to ocular trauma patients.
3. To determine the visual outcomes and the complications due to ocular trauma.

### **5.0 MATERIALS AND METHODOLOGY**

#### **5.1 MATERIALS**

A structured questionnaire, appendix IV, was used as the tool for this study.

#### **5.2 STUDY DESIGN**

This study was a Retrospective hospital-based case series.

#### **5.3 STUDY AREA**

The Eye Clinic, Tamale Teaching Hospital (TTH), Tamale, Ghana was the study area.

#### **5.4 STUDY POPULATION**

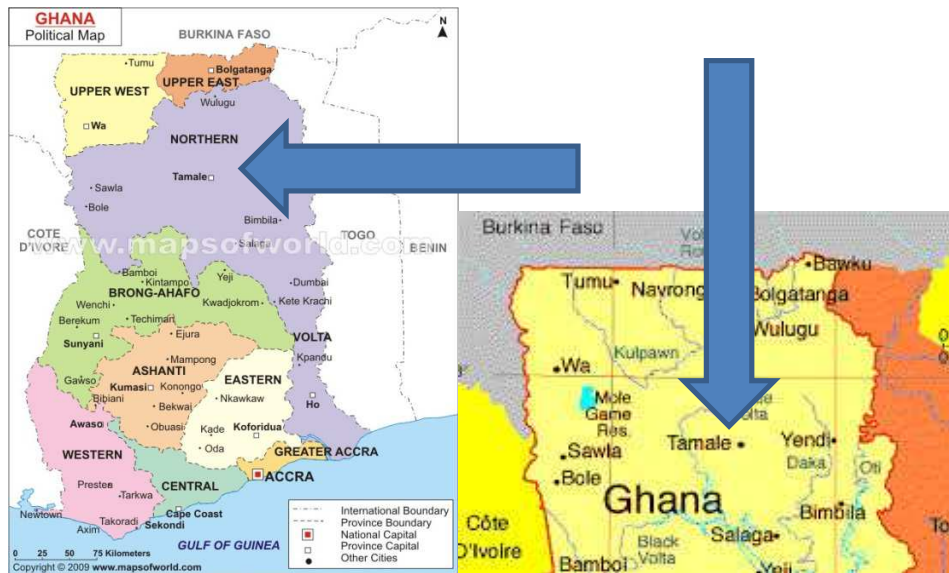
The study population included all new patients who attended the TTH Eye Clinic with a diagnosis of ocular trauma in the year 2010.

#### **5.5 STUDY SETTING**

The study setting was the Tamale Teaching Hospital, a university teaching and referral hospital located in Tamale, the third largest city in Ghana. Ghana's population based on the 2010 Census was 24,658,823, and that of the Northern Region, Tamale, was 2,479,461.<sup>24</sup> The Eye Clinic is

run by an Ophthalmologist, Optometrists and Ophthalmic Nurses. Majority of the patients are from Tamale and are mostly Ghanaian with few foreigners. There are however other public and private eye clinics in the region.

**Figure 1: Image showing the map of Ghana and Tamale**



**Map of Ghana and Tamale; Arrows indicating the study area/ setting.**<sup>25, 26</sup>

## 5.6 CASE DEFINITION

All new patients with a diagnosis of ocular trauma who attended TTH eye clinic on out-patient basis or admitted at TTH eye ward from 1<sup>st</sup> January to 31<sup>st</sup> December, 2010.

## 5.7 INCLUSION CRITERIA

Records of new patients of all ages with ocular trauma who attended the Eye Clinic at TTH within the stated study duration were included in the study.

## 5.8 EXCLUSION CRITERIA

Missing records of patients with ocular trauma were excluded.

## 5.9 DATA COLLECTION PROCEDURE AND MANAGEMENT

### 5.9.1 Data collection procedure

All new patients of all ages with various eye conditions from 1<sup>st</sup> January to 31<sup>st</sup> December 2010 were reviewed from the outpatient/ inpatient record books and the sex and age recorded. Data was collected by liaising with the medical information/ record officers working at the records office. The date of attendance/ hospitalization, name, age, and the patient number was obtained from the out-patient attendance record and the in-patient record book in the clinic and the ward, respectively. This information was then used to retrieve all new files at the medical information and records department. Consecutive patients' files which met the inclusion criteria were constituted. The relevant data such as epidemiological characteristics, referral pattern, interventions, visual outcomes and complications of ocular trauma were reviewed, collected and

entered into the structured questionnaire shown in Appendix IV on perusal of the medical records. Any additional information or clarification was obtained from the medical staff where necessary.

### **5.9.2 Data management and analysis**

Each questionnaire had a serial number which was the unique key identifier variable and each patient's medical record/ file was linked to this serial number. A separate code book was used to store this information including the out-patient and in-patient numbers. Each questionnaire was cross checked for completeness after data collection for each day. The original medical record was used to fill in missing blanks. Data was validated prior to entry. Double entry of questionnaire into computer's Microsoft Excel data base 2010 was done to reduce errors. The data was then exported into STATA version 12 (Stata Corp, College Station, Texas) and analyzed with the help of a statistician. Descriptive analysis was done to determine the frequencies and proportions for the various variables (continuous/ categorical) and presented in figures or tables where appropriate. Chi-square ( $\chi^2$ ) test was used for comparison of proportions. 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 in a safe and secure locker.

## **5.10 MAIN OUTCOME MEASURES**

The main outcome measures were:

1. Post treatment best corrected visual acuity.
2. Complications resulting from ocular trauma.

## **5.11 ETHICAL CONSIDERATIONS**

### **5.11.1 Confidentiality**

No consent was required as my study was of a retrospective nature using only the patients' records from 1<sup>st</sup> January to 31<sup>st</sup> December, 2010 and the investigator did not come into contact with the patients in person. Patient's information only appeared in the coded questionnaire but not in any other publication. Names of patients or clinicians were not recorded. The information on the questionnaire was only accessible to the investigators and the statistician who upheld confidentiality and adhered to data protection standards. The coded questionnaires was stored and transported in a safe and secure locker and was destroyed after the data was analysed.

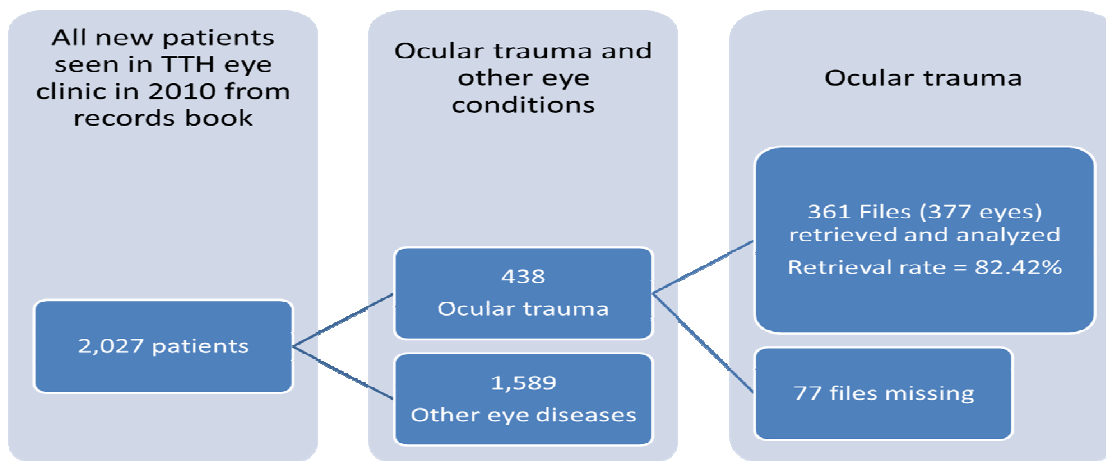
### **5.11.2 Approval by Ethics Committees**

The proposal was submitted to the Tamale Teaching Hospital (TTH)/ Ghana Health Service (GHS) and the Kenyatta National Hospital (KNH)/ University of Nairobi (UON) Ethics and Research Committees for approval before commencement. The result of this study was shared with the relevant stake-holders including TTH/GHS and KNH/UON to help improve service delivery and formulate preventive measures with regards to ocular trauma.

## 6.0 RESULTS

The total number of new patients with various eye diseases that attended the Tamale Teaching Hospital (TTH) Eye Clinic from 1<sup>st</sup> January to 31<sup>st</sup> December, 2010 was 2,027 from the outpatient and inpatient record books. Four hundred and thirty eight were ocular trauma patients. Three hundred and sixty one files/ folders consisting of 377 eyes were retrieved manually. The retrieval rate was 82.42%. Seventy seven files were missing. A flow chart for the data collection is shown in figure 2 below.

**Figure 2: Flow chart showing the data collection of new patients' records reviewed at TTH Eye Clinic**



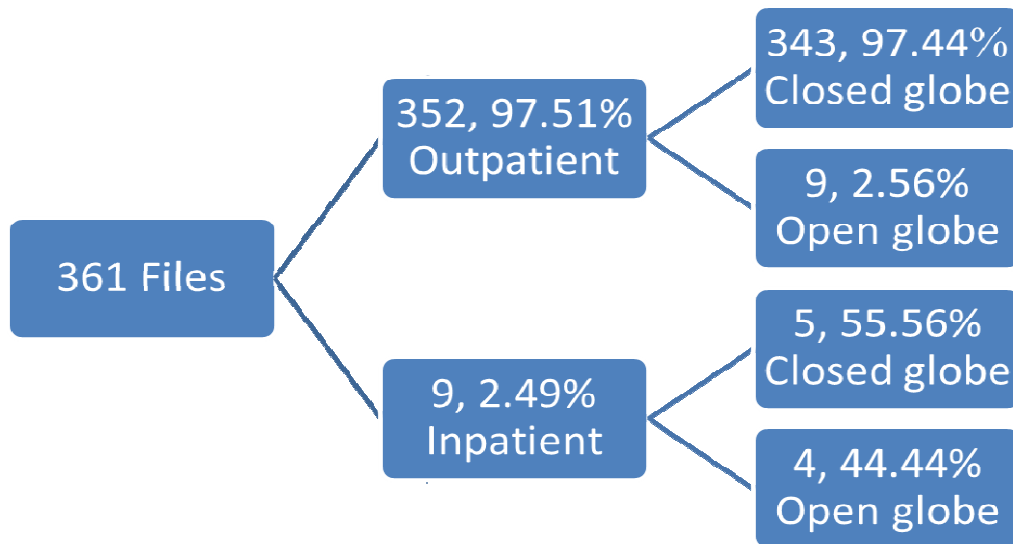


**Table 1: Demographic characteristics of all new patients in TTH Eye Clinic, Ghana, 2010**

<b>Demographic characteristic</b>	<b>All new patients</b>	<b>Ocular trauma patients</b>
	<b>Number (%)</b>	<b>Number (%)</b>
<b>Sex</b>		
Male	971 (47.90)	224 (62.05)
Female	1026 (50.62)	128 (35.45)
Unrecorded	30 (1.48)	9 (2.5)
<b>Total</b>	<b>2027 (100)</b>	<b>361 (100)</b>
<b>Age group</b>		
0 – 9	302 (14.90)	61 (16.90)
10 – 19	327 (16.13)	53 (14.68)
20 – 29	386 (19.04)	99 (27.42)
30 – 39	334 (16.48)	76 (21.05)
40 -49	204 (10.06)	38 (10.53)
>49	474 (23.38)	34 (9.42)
<b>Total</b>	<b>2027 (100)</b>	<b>361 (100)</b>

The male: female ratio of all patients attending TTH Eye Clinic with various eye conditions was 1:1.1 ( $p=0.09$ ) and that for ocular trauma patients was 1.8:1 ( $p<0.01$ ). Majority of patients with various eye conditions were older than 49 years whilst ocular trauma patients were mainly in the 20 – 29 year age group as shown in table 1 above.

**Figure 3: Flow chart showing inpatient and outpatient distribution and type of globe trauma sustained**



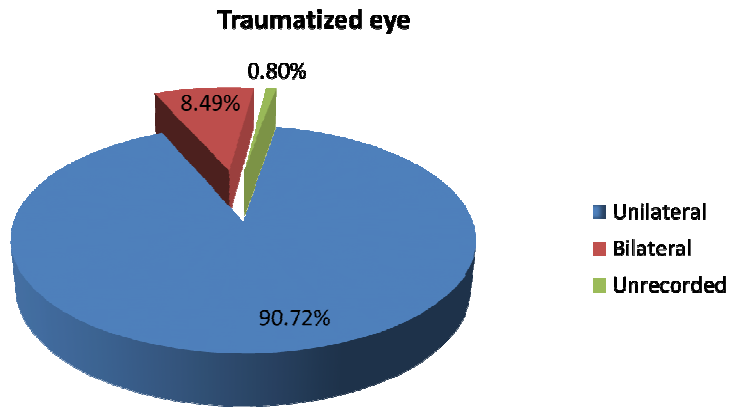
Most eyes were treated on outpatient basis and majority had closed globe trauma as shown in figure 3 above.

**Table 2: Characteristics of ocular trauma patients**

<b>Ocular trauma patients</b>	<b>Number (%)</b>
<b>Occupation</b>	
Child/ Student	127 (35.18)
Manual	100 (27.70)
Farmer	40 (11.08)
Professional	38 (10.53)
Unrecorded	30 (8.31)
Unemployed	22 (6.09)
Retired	4 (1.11)
<b>Total</b>	<b>361 (100)</b>
<b>Place of residence</b>	
Urban	253 (70.08)
Rural	84 (23.27)
Unrecorded	24 (6.65)
<b>Total</b>	<b>361 (100)</b>
<b>Education Level</b>	
Unrecorded	137 (37.95)
No formal education	70 (19.39)
Tertiary	63 (17.45)
Pre school	36 (9.97)
Primary	28 (7.76)
Secondary	27 (7.48)
<b>Total</b>	<b>361 (100)</b>

From table 2 above, ocular trauma occurred commonly among children/ students. Most patients resided in urban areas. The educational level was unrecorded in the majority.

**Figure 4: Laterality of traumatized eyes**



Unilateral ocular trauma was the commonest, 342 (90.72%), presentation as shown in Figure 4 above, from a total of 377 eyes.

**Table 3: Agents causing ocular trauma**

Eyes	Number (%)
<b>Agent of ocular trauma</b>	
Unrecorded	224 (59.41)
Organic*	60 (15.92)
Other**	58 (15.39)
Metallic***	22 (5.84)
Chemical****	13 (3.45)
<b>Total</b>	<b>377 (100)</b>

\*organic (stick, wood, broom stick, branch, twig, insect, goat horn, cow's kick), \*\*other (stone, sand, dust, knife, fist, blow, slap, fall, football, glass, bottle, rubber band, hot flame, air blast), \*\*\*metallic (nail, wire, bullet, pellet), \*\*\*\*chemical (acid, alkaline, gun powder shots)

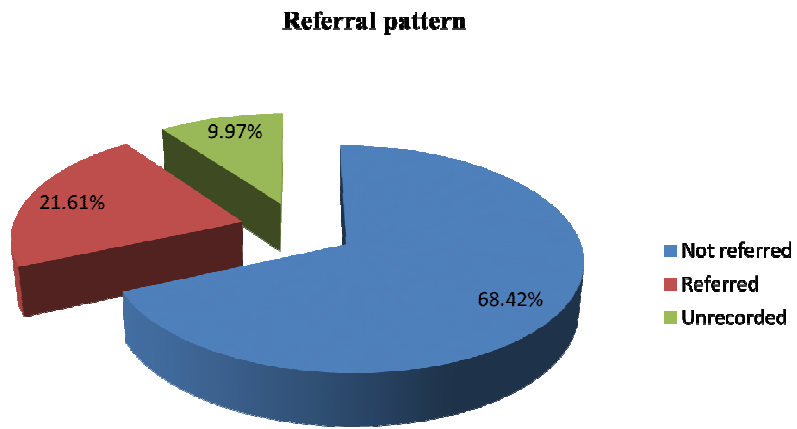
From table 3 above, the agents causing ocular trauma was unrecorded in the majority of ocular trauma patients.

**Table 4: Circumstance and place of ocular trauma**

<b>Ocular trauma patients</b>	<b>Number (%)</b>
<b>Circumstance of ocular trauma</b>	
Unrecorded	175 (48.47)
Accidental	158 (43.77)
Attack/ Assault	28 (7.76)
<b>Total</b>	<b>361 (100)</b>
<b>Place of ocular trauma</b>	
Unrecorded	236 (65.37)
Home	55 (15.24)
Workplace	25 (6.93)
Farm	18 (4.99)
Road	17 (4.71)
School	10 (2.77)
<b>Total</b>	<b>361 (100)</b>

From table 4 above, the circumstance and place of ocular trauma was unrecorded in the majority.

**Figure 5: Referral pattern of ocular trauma patients**



From Figure 5 above, out of a total of 361, the majority, 247 (68.42%), of ocular trauma patients were seen at TTH without a referral.

**Table 5: Distribution of eyes by adnexa, orbit and globe findings**

Eyes (N = 377)	Number (%)
<b>Ocular findings*</b>	
Conjunctival lesion	144 (38.20)
Ocular surface foreign body	105 (27.85)
Corneal epithelial defect/ ulcer	36 (9.55)
Other**	25 (6.63)
Cataract	22 (5.84)
Lid contusion	19 (5.04)
Corneal opacity/ scar	10 (2.65)
Traumatic Uveitis	10 (2.65)
Lid laceration	9 (2.39)
Other**	9 (2.39)
RAPD	8 (2.12)
Hyphaema	7 (1.87)
Optic atrophy	6 (1.59)
Corneal perforation and uveal prolapse	5 (1.33)
Corneal perforation	4 (1.06)

\*multiple findings, \*\*Other include: Hypopyon, Phthisis bulbi, Endophthalmitis and Vitreous haemorrhage 3 (0.80%) each; Corneoscleral perforation and uveal prolapse, and Dislocated lens 2 (0.53%) each; Ptosis, Orbital fracture, Oclusio seclusion pupillae, Iridodialysis, Ruptured globe, Chorio retinal scar, Retinal detachment and macula hole, Retinal detachment and Vitro retinal haemorrhage 1 (0.27%) each.

The total findings (419) in table 5 above are more than N (377) due to multiple findings in ocular trauma patients. Conjunctival lesions and ocular surface foreign bodies were the commonest findings at presentation following ocular trauma.

**Table 6: Distribution of traumatized eyes by intervention rendered**

<b>Eyes</b>	<b>Number (%)</b>
<b>Intervention*</b>	
Medical treatment alone	243 (64.46)
Removal of ocular surface foreign body	102(27.06)
Lid repair	10(2.65)
Cornea repair	5 (1.33)
Lens washout and primary intraocular lens implant	4 (1.06)
Primary evisceration	4 (1.06)
Uveal abscission and cornea repair	3 (0.80)
Anterior chamber washout	2 (0.53)
Lens washout	2 (0.53)
Lens washout anterior vitrectomy and primary intraocular lens implant	1 (0.27)
Cornea repair lens washout and anterior vitrectomy	1 (0.27)
<b>Total</b>	<b>377 (100)</b>

\*most significant intervention recorded

The most common intervention rendered to ocular trauma patients was medical treatment. One hundred and thirty four (35.54%) eyes had surgical intervention of which removal of ocular surface foreign bodies were the commonest as shown in table 6 above.



**Table 7: Distribution of visual acuity (VA) at presentation and up to 2 years of follow up**

<b>WHO CLASSIFICATION</b>	<b>VA OF EYES AT PRESENTATION</b>	<b>BCVA AT FOLLOW-UP PERIOD (EYES)</b>			
		<b>3Months</b>	<b>6Months</b>	<b>1Year</b>	<b>2Years</b>
6/6 - <6/18 (Normal vision)	227 (67.36%)	6(21.43%)	5 (35.71%)	3(27.27%)	3(37.50%)
6/18 - <6/60 (Visual impairment)	41 (12.17%)	7(25.00%)	5 (35.71%)	3(27.27%)	0
6/60 - <3/60 (Severe impairment)	6 (1.78%)	1(3.57%)	0	0	0
3/60 – NPL (Blind)	63(18.69%)	14(50.00%)	4(28.57%)	5(45.45%)	5(62.50%)
<b>TOTAL</b>	<b>337(100%)</b>	<b>28(100%)</b>	<b>14(100%)</b>	<b>11(100%)</b>	<b>8(100%)</b>

By the WHO Classification, majority of ocular trauma patients had normal vision at presentation. Patients who were monocularly blind following ocular trauma were more likely to come for follow up compared to those with normal vision ( $p < 0.01$ ) as shown in table 7 above.

**Table 8: Distribution of eyes with or without complications due to ocular trauma**

<b>Eyes*</b>	<b>Number (%)</b>
No complications	337(89.39)
Corneal opacities/ scars	16 (4.24)
Secondary glaucoma	11 (2.92)
Other**	8 (2.12)
Cataracts	3 (0.80)
Phthisis bulbi	2 (0.53)
<b>Total</b>	<b>377 (100)</b>

\*severest complication recorded, \*\*Other include; Anterior staphyloma, Hyphaema, Infected socket, Loose corneal suture, Retinal detachment, Posterior capsular opacity, Traumatic uveitis, Refractive error, each comprising 1(2.50%)

From table 8 above, majority of traumatized eyes had no complications due to ocular trauma. Forty (10.61%) eyes had complications of which corneal opacities/ scars were the commonest.

## 7.0 DISCUSSION

In this study a total of 2,027 new patients with various eye conditions were seen out of which 438 were ocular trauma patients. Three hundred and sixty one patients' files/ folders consisting of 377 eyes were reviewed. The Male: Female ratio was 1:1.1 ( $p=0.09$ ) for all new patients with various eye conditions whilst it was 1.8:1 ( $p<0.01$ ) for new ocular trauma patients. There was no statistically significant difference among males and females attending the eye clinic with various eye conditions but in terms of ocular trauma males were more affected compared to females. This is in keeping with a study in the USA in 2011, where eye injuries were 1.7 times higher for males than females.<sup>3</sup> Momanyi et al (2011) found a higher male to female ratio of 2.5:1 in Kenya.<sup>12</sup> These findings may be due to the fact that generally males are usually more involved in adventurous activities and manual jobs.

Nearly a quarter 474 (23.38%) of all new patients with various eye conditions were more than 49 years old, whilst a little more than a quarter 99 (27.42%) of ocular trauma occurred in the 20 – 29 year age group. The Minimum age at which ocular trauma occurred was 0.4 years and the maximum age was 80 years. The Median age was 26 years with an interquartile range, IQR, of 19 years. These findings are consistent with a study in Kenya where Momanyi et al (2011) found the most common age group to be 21-30 years (28.4%) and a median age of 24 years.<sup>12</sup> Also in South Africa (2012), young patients between 21 and 30 years old incurred more ocular injuries (31.4%).<sup>8</sup> Thus, the commonest age group within which ocular trauma occurred was in the prime age and this reduces the productivity of the individual and the families as a whole since such people turn to be the breadwinner of their families. Of concern is the age group 0-9 years, 61 (16.90%) because of the many disability adjusted life years (DALYs) ahead of them and they are also at high risk of developing amblyopia. This is similar to a South African study where 13.8% of patients incurring ocular injuries were children up to the age of 12 years.<sup>8</sup>

Most eyes 364 (96.55%) sustained closed globe trauma whilst 13 (3.45%) were open globe trauma. This agrees with studies in Nepal where the commonest type of trauma was closed globe injury 784 (73.3%) and open globe 57 (5.3 %),<sup>20</sup> in New Zealand where 253 open globe injuries (OGI) and 568 closed globe injuries (CGI) ( $p<0.001$ ) were reported<sup>4</sup> and in India where closed globe injury was 41 (68.33%) and open globe injury 19 (31.67%).<sup>18</sup>

The vast majority 352 (97.51%) of ocular trauma patients in this study were treated on outpatient basis whilst 9 (2.41%) were inpatient/ admitted. This is consistent with a study in the USA where about 3.1% of patients with eye injuries were admitted to the hospital.<sup>3</sup> In this study, clients who had closed globe trauma were more likely to be treated on outpatient basis compared to those with open globe trauma ( $p<0.01$ ).

In terms of occupation, ocular trauma occurred commonly among children/ students, 127 (35.18%), and manual workers, 100 (27.7%). This is in keeping with a study in Kenya where children/ students were commonly affected, 63 (55%).<sup>12</sup> Majority of ocular trauma patients resided in urban areas, 253 (70.08%), and a few, 84 (23.27%), in rural areas. The agent, the circumstance and the place of ocular trauma was unrecorded in the majority 137 (37.95%) patients, 242 (59.41%) eyes, 175 (48.47%) patients and 236 (65.37%) patients, respectively. This

reflects poor records/ clerking of patients and one cannot make any meaningful inferences with regards to these variables.

Unilateral eye trauma was the commonest 342 (90.72%) whilst both eyes were injured in 32 (8.49%) ocular trauma patients due to hot flames, chemical burn, air blast and accidental gun powder shots. This is consistent with a study in South Africa where unilateral injuries were more frequent than bilateral injuries (97.5% versus 2.5%, respectively).<sup>8</sup> The right eye was most often injured compared to the left, 177 (47.33%) and 165 (44.12%), respectively. This is in keeping with a study in Nigeria where the right eye was involved in 60 (45.5%) subjects, the left eye in 59 (44.7%) cases and bilateral in 13 (9.9%).<sup>19</sup>

Majority, 247 (68.42%), of ocular trauma patients were seen at TTH without a referral whilst 78 (21.61%) were referred after first aide and/or treatment at other health facilities.

Visual acuity at first presentation was recorded in 327 (90.58%) of ocular trauma patients. It was unrecorded in 29 (8.42%) of patients under 10 years. Clients from rural areas were more likely to have monocular visual impairment/ blindness, 24 (17.02%) ( $p < 0.01$ ) compared to those who came from urban areas. Nine out of 11 ocular trauma patients who had open globe trauma were immediately blind and none had normal vision on presentation. Two hundred and thirty two (70.09%) patients with normal vision after ocular trauma had closed globe trauma. This is consistent with a study in Ethiopia where blindness was associated with open globe injury (85.2%,  $p < 0.001$ ) and rural residence (66.7%,  $P < 0.001$ ).<sup>27</sup>

Conjunctival lesions were the commonest, 144 (38.20%), finding in traumatized eyes at presentation followed by ocular surface foreign bodies 105 (28.75%) and cornea epithelial defects/ ulcers 36 (9.55%). In Nigeria, Emem et al (2012) found that lid /conjunctival injuries were most common 85 (38.6%).<sup>10</sup>

Three (0.80%) patients had endophthalmitis in this study, two were injured by organic matter (goat's horn and stick), and the other agent of trauma was unrecorded. They presented with a visual acuity of no light perception (NPL). Two were open globe and one was closed globe trauma. One had primary evisceration done whilst the other two developed phthisis bulbi.

The most common intervention rendered to traumatized eyes in our study was medical treatment alone, 243 (64.46%), of which topical antibiotics alone/ combination were the commonest, 360 (95.49%), followed by analgesics alone/ combination 170 (40.09%). This is consistent with a study in Ethiopia, where topical antibiotics and analgesics were the most common modality of treatment (63.4%).<sup>27</sup> One hundred and thirty four (35.54%) eyes had surgical intervention of which removal of ocular surface foreign bodies were the commonest, 102 (27.06%).

Four (2.99%) patients had primary evisceration done in our study, the circumstance of ocular trauma was farming/ hunting. All of them presented with a visual acuity of no light perception (NPL). They included three corneoscleral perforations with uveal prolapse and one endophthalmitis.

By the WHO Classification, out of 337 traumatized eyes (whose vision was recorded), majority 227 (67.36%) had normal vision. Forty seven (13.95%) were monocularly visually impaired and 63 (18.42%) were monocularly blind immediately after sustaining ocular trauma in this study. Patients who were monocularly blind following ocular trauma were more likely to come for follow up compared to those with normal vision ( $p < 0.01$ ). In a prospective observational study in Ethiopia, out of 254 new patients (265 eyes), about 81 (34.3%) injured eyes were blind and 35 (14.8%) were visually impaired.<sup>27</sup> Though, in our study, the accuracy of visual assessment might have been interfered by the failure to record visual acuity in 40 (10.61%) patients.

The majority, 337 (89.39%), of traumatized eyes had no complications due to ocular trauma. Forty (10.61%) eyes had complications of which corneal opacities/ scars were the commonest, 16 (4.24%), followed by secondary glaucoma, 11 (2.92%). A study in Kenya also showed the commonest complication to be corneal opacities 14 (16.7%).<sup>12</sup> Thus, corneal opacities/ scars commonly complicates ocular trauma and should be addressed in the management of such patients.

Ocular trauma was a relatively common health problem especially among males in the economically active age group and a significant cause of monocular visual impairment/ blindness in TTH, Tamale, Ghana. Public awareness campaign on preventive measures need to be instituted to reduce the incidence and debilitating effects of ocular trauma as it has the potential of increasing the incidence of poverty in the community and the country as a whole because visual impairment/blindness from trauma has the potential to reduce ones productivity and that of the family as a whole since most affected persons turn to be the breadwinner of their families. Children with visual impairment/blindness from trauma have many disability adjusted life years (DALYs) ahead of them and they are also at high risk of developing amblyopia.

## **7.1 CONCLUSION**

1. Ocular trauma was 1.8 times higher for males than females and almost half were in the economically active age group. Majority of ocular trauma patients were seen at TTH without a referral.
2. The commonest intervention was medical treatment alone. Removal of ocular surface foreign bodies was the next most frequent intervention.
3. Ocular trauma was a significant cause of monocular visual impairment/ blindness though majority of ocular trauma patients had no complications due to ocular trauma.

## **7.2 RECOMMENDATIONS**

1. Proper documentation and record keeping is needed at presentation and follow up for proper management and as a reference for research, medico-legal purposes and compensation claims. Notwithstanding, our objectives were met.
2. There is the need for public awareness campaign on the prevention of ocular trauma as severe cases presents with poor vision with poor prognosis even with appropriate intervention.

### **7.3 LIMITATIONS OF THE STUDY**

1. The study was done using data for the year 2010 which is probably not a true representation of the current management of ocular trauma in the Eye Clinic since ocular trauma management keeps evolving.
2. Certain variables could not be interpreted as the data were unrecorded/ missing.
3. This study was hospital based and the subjects were not representative of the population at risk.

## REFERENCES

1. Kanski J, Bowling B. *Clinical Ophthalmology - A Systemic Approach*. 7th ed. Elsevier publishers; 2011.
2. Ophthalmology AA of. *External Disease and Cornea*. Section 8. Canada: AAO; 2012.
3. Owens PL, Mutter R. STATISTICAL BRIEF # 112 Related to Eye Injuries , 2008. 2011;31(1):1-10.
4. Pandita A, Merriman M. Ocular trauma epidemiology: 10-year retrospective study. *N Z Med J*. 2012;125(1348):61-69. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22282278>.
5. Chua D, Wong W, Lamoureux EL, Aung T, Saw S-M, Wong TY. The Prevalence and Risk Factors of Ocular Trauma: The Singapore Indian Eye Study. *Ophthalmic Epidemiol*. 2011;18(6):281-287. doi:10.3109/09286586.2011.628775.
6. Cao H, Li L, Zhang M. Epidemiology of Patients Hospitalized for Ocular Trauma in the Chaoshan Region of China, 2001-2010. *PLoS One*. 2012;7. doi:10.1371/journal.pone.0048377.
7. Titiyal GS, Prakash C, Gupta S, Joshi V. Pattern of Ocular Trauma in Tertiary Care Hospital of Kumaon Region , Uttarakhand. 2013;35(2):116-119.
8. Sukati V, Hansraj R. A retrospective analysis of eye injuries in rural KwaZulu-Natal , South Africa. *S Afr Optom*. 2012;71(4):159-165.
9. Misa F. A review of Eye injuries in adults hospitalised at Kenyatta National Hospital (KNH) Eye Ward. 2011. Available at: <http://erepository.uonbi.ac.ke/handle/11295/4429>. Accessed January 1, 2015.
10. Emem A, Uwemedimbuk E. PREVALENCE OF TRAUMATIC OCULAR INJURIES IN A TEACHING HOSPITAL IN SOUTH –SOUTH NIGERIA- A TWO YEAR REVIEW. 2012;2(3):102-108.
11. Gyasi ME, Amoaku WM, Adjuik M. Causes and incidence of destructive eye procedures in north-eastern Ghana. *Ghana Med J*. 2009;43(3):122-6. Available at: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2810245&tool=pmcentrez&rendertype=abstract>.
12. Momanyi C. Pattern and outcomes of Ocular trauma in patients seen at Moi Teaching and Referral Hospital. 2011;306:306. Available at: <http://erepository.uonbi.ac.ke/handle/11295/4514>. Accessed January 1, 2015.

13. Malik IQ, Ali Z, Rehman A, Moin M, Hussain M. Epidemiology of Penetrating Ocular Trauma. 2012;28(1):14-16.
14. Agrawal R, Wei HS, Teoh S. Prognostic factors for open globe injuries and correlation of ocular trauma score at a tertiary referral eye care centre in Singapore. *Indian J Ophthalmol*. 2013;61:502-6. doi:10.4103/0301-4738.119436.
15. Jovanovi M, Vukovi D, Jakšić V, Knežević M, Žori L, Mirković M. A 10-Year Survey of Severe Eye Injuries in Sport in Belgrade , Serbia 2000-2009. 2013;2013(August):93-96.
16. Rafindadi A, Pam V, Chinda D, Mahmud-Ajeigbe F. Orbital and ocular trauma at Ahmadu Bello University Teaching Hospital, Shika-Zaria: A retrospective review. *Ann Niger Med*. 2013;7(1):20. doi:10.4103/0331-3131.119982.
17. Pine KR, Sloan B, Jacobs RJ. THE NEW ZEALAND Biosocial profile of New Zealand prosthetic eye wearers. 2012;125(1363):29-38.
18. Misra S, Nandwani R, Gogri P, Misra N. Clinical profile and visual outcome of ocular injuries in a rural area of western India. *Australas Med J*. 2013;6(11):560-4. doi:10.4066/AMJ.2013.1876.
19. Omolase CO, Omolade EO, Ogunleye OT, Omolase BO, Ihemedu CO, Adeosun OA. Pattern of Ocular Injuries in Owo , Nigeria. 2011;6(2):114-118.
20. Kinderan Y, Shrestha E, Maharjan I, Karmacharya S. Pattern of ocular trauma in the Western Region of Nepal. *Nepal J Ophthalmol*. 2012;4(7):5-9.
21. Han SB, Yang HK, Woo SJ, Hyon JY, Hwang J-MM. Association of alcohol consumption with the risk of ocular trauma. *J Korean Med Sci*. 2011;26:675-678. doi:DOI 10.3346/jkms.2011.26.5.675.
22. Ophthalmology AA of. *Orbit , Eyelids , and Lacrimal System*. Section 7. Canada: AAO; 2012.
23. Agrawal R, Ho SW, Teoh S. Pre-operative variables affecting final vision outcome with a critical review of ocular trauma classification for posterior open globe (zone III) injury. *Indian J Ophthalmol*. 2013;61:541-5. doi:10.4103/0301-4738.121066.
24. Ghana Statistical Service. 2010 Population and Housing Census Summary of Final Results. 2010;(June 2012):1-15. Available at: <http://www.statsghana.gov.gh/censuses.html>. Accessed June 17, 2014.
25. Google I. Regions, Ghana. Available at: [google.com](http://google.com). Accessed June 17, 2014.
26. Google I. Tamale, Ghana. Available at: [google.com](http://google.com). Accessed June 17, 2014.



27. Alemayehu W, Shahin S. Epidemiology of ocular injuries in Addis Ababa Ethiopia. *J Ophthalmol East Cent South Africa*. 2014;(July):27-34.

## APPENDICES


### APPENDIX I: TIME LINES

Time line/ work plan for the study

Activities	JAN 2014	FEB 2014	MAR 2014	APR 2014	MAY 2014	JUN 2014	AUG 2014	SEP 2014	OCT 2014	NOV 2014	DEC 2014	JAN 2015	FEB 2015
Proposal development													
Research and Ethical Committee approval													
Data collection													
Data analysis													
Report writing													
Dissemination of findings													

The Gantt chart for the work plan

## APPENDIX II: CERTIFICATE OF AUTHORIZATION FROM TTH

 Department of Research & Development  
Tamale Teaching Hospital

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TTH/R&M/SR/13/70  
11/06/2014

TAMALE TEACHING HOSPITAL


**CERTIFICATE OF AUTHORIZATION TO CONDUCT RESEARCH IN TAMALE TEACHING HOSPITAL**

I hereby introduce to you **DR GILBERT BATIEKA BONSAANA** a Master of Medicine student from the **University Nairobi** who has been duly authorized by Management to conduct a Research on **"REVIEW OF OCULAR TRAUMA IN TAMALE TEACHING HOSPITAL, TAMALE, GHANA"**.


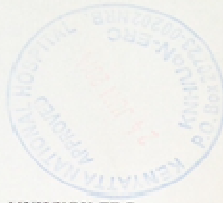

Please accord him the necessary assistance to be able to complete his project.

If in doubt, kindly contact the Research and Development on Telephone 0243233840. In addition, kindly report any misconduct of the Researcher to the Research & Development for necessary action, please. If in doubt, kindly contact the Research Unit on Telephone 00233243233840.

Thank You.

  
**HUSSEIN HAWAWU**  
**HEALTH RESEARCH OFFICER**  
**For:DD (RESEARCH & DEVELOPMENT)**

## APPENDIX III: KNH/UON-ERC APPROVAL



**UNIVERSITY OF NAIROBI**  
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P O BOX 19676 Code 00202  
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**KNH/UON-ERC**  
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Website: [www.uonbi.ac.ke](http://www.uonbi.ac.ke)

**KENYATTA NATIONAL HOSPITAL**  
P O BOX 20723 Code 00301  
Tel: 7263009-9  
Fax: 725272  
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/202      Link: [www.uonbi.ac.ke/activities/KNHUoN](http://www.uonbi.ac.ke/activities/KNHUoN)      24<sup>th</sup> June 2014

Dr. Gilbert Bateka Bonsaana  
Dept. of Ophthalmology  
School of Medicine  
University of Nairobi

Dear Dr. Bonsaana

**RESEARCH PROPOSAL: REVIEW OF OCULAR TRAUMA IN TAMALE TEACHING HOSPITAL,  
TAMALE, GHANA (P173/04/2014)**

---

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 24<sup>th</sup> June 2014 to 23<sup>rd</sup> June 2015.

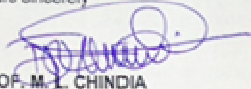
This approval is subject to compliance with the following requirements:

- 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 severe 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-Ethics & Research Committee 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 [www.uonbi.ac.ke/activities/KNHUoN](http://www.uonbi.ac.ke/activities/KNHUoN).

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 Chairperson, KNH/UoN-ERC  
The Assistant Director, Health Information, KNH  
The Dean, School of Medicine, UoN  
The Chairman, Dept. of Ophthalmology, UoN  
Supervisors: Dr. Emmanuel Muindi Nyenze, Dept. of Ophthalmology, UoN  
Prof. Dunera Rahel Ilako, Dept. of Ophthalmology, UoN  
Dr. Seth Wanyo, University for Development Studies, Tamale Teaching Hospital, Ghana

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## APPENDIX IV: QUESTIONNAIRE

**A Review of Ocular Trauma in Tamale Teaching Hospital (TTH), Ghana. 2010.**  
(The code applicable to a listed item is derived from the number of the item. '1' is the code applicable for a 'Yes' response and '0' for a 'No' response).

**Patient's Serial/Code Number:**

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

separate confidential

### **Demographic characteristics**

**Sex:** Male = 1; Female = 2; unknown=3      **Age** .....

#### **Age Range:**

<10 years = 1; 10 – 19 years = 2;      20 – 29 years = 3;      30 – 39 years = 4;  
40 – 49 years = 5;      50 – 59 years = 6;      >59 years = 7      unknown=8

**Occupation** .....      Unknown      N/A

**Residence:**      within Tamale = 1;      within N/R = 2;      outside N/R = 3      unknown=4

#### **Education level:**

Preschool = 1; Kindergarten = 2;      Nursery = 3;      No schooling = 4;      Primary = 5;  
Secondary = 6;      Tertiary (College/University) = 7      unknown = 8

**Date of first attendance (dd/mm/yyyy) .....**      **DOA (dd/mm/yyyy)...../...../.....**

**DOD (dd/mm/yyyy) .....**

**Duration of admission:** <3 days = 1;      3 - 7 days = 2;      8 – 14 days = 3;      >14 days = 4      N/A=5

### **HISTORY**

**Eye injured:** RE = 1; LE = 2; both eyes = 3

unknown=4

#### **Agent of injury:**

Knife = 1;      Fist/blow/slaps = 2;      Fall = 3; stick/wood/broom stick/branch/twig = 4;  
Stone/sand/dust= 5;      Metal/nail/wire = 6;      Glass/bottle = 7;      Chemical (acid/alkaline) = 8;  
Rubber band = 9;      Hot flame = 10;      Bullet/pellet /gun powder = 11;      Unknown = 12;      Other = 13, If yes specify please, 14 = football; 15 = insect.

#### **Mode of injury:**

Accidental = 1; Attack/assault = 2; Unknown = 3; other = 4

#### **Circumstances of injury:**

Home = 1;      Child play = 2, If yes, please specify      School = 3;  
Assault = 4;      Farm/hunting = 5;      Work place/Industry/Construction site = 6;      RTA = 7;  
Sports related = 8;      Gunshot = 9;      Unknown = 10; other = 11, If yes, please specify

#### **Number of days of injury before presentation to a health facility:**

<1day = 1;      1 – 3 days = 2; 4 – 6 days = 3;      7 – 14 days = 4;      >14 days = 5      unknown=6

#### **Number of days of injury before presentation to TTH:**

<1day = 1;      1 – 3 days = 2;      4 – 6 days = 3;      7 – 14 days = 4;      >14 days = 5      unknown=6

#### **Past ocular disease:**

Previous poor vision = 1;      Previous ocular trauma = 2;      Previous eye surgery = 3      none=4

#### **Treatment before attending TTH:**

None = 0; Eye pad/shield = 1; Analgesics = 2      Topical antibiotics = 3;  
Topical steroids = 4;      Systemic antibiotics = 5;      Tetanus toxoid = 6;      Surgery = 7; other = 8

### **EXAMINATION**

(Please, responses in the following sections are Yes/No unless otherwise specified)

**3a. General signs at presentation**

Fever: Yes/No , Other significant systemic findings relating to trauma: Yes/No

If yes, please specify

**Visual acuity (VA) on first presentation:**

Not done = 0; Done = 1 Specify if done, please; RE ..... LE.....

**Intraocular pressure of injured eye:**

Not done = 0; Done = 1, If done specify; RE:.....mmHg LE:.....mmHg

**3b. Ocular Adnexa**

Lid laceration, Orbital fracture, Retrobulbar haemorrhage, Lid oedema, Orbital FB

**3c. Anterior and Posterior Segment findings:**

Blunt trauma(closed globe), open globe, Subconj haemorrhage, conj fb, corneal fb, Conjunctiva laceration, Sclera perforation/laceration, Corneal perforation/laceration, Hyphaema, Vitreous in AC, Lens matter in AC, Hypopyon, RAPD: present = 1 absent = 0 not checked = 3, Cataract, Iris prolapsed , Iridodialysis, Lens rupture, Endophthalmitis, Subluxated/ Dislocated lens, Vitreous haemorrhage, uveitis, IOFB, retinal h'ge, RD

**INVESTIGATIONS DONE**

Fbc, sickling, Skull/orbit X-ray, Ultrasonography, CT Scan, Vitreous tap, Blood culture ,Other,please specify, none

**TREATMENT GIVEN**

Medical = 1; Surgical = 2 both 3

**If surgery was done, please answer 5a to 5b:**

**5a. No. of days waiting for surgery:**

<1 day = 1; 1 day = 2; 2 days = 3; 3 days = 4; >3 days = 5

**5b. Type of surgical procedure;**

Lid repair, Conjunctival repair, Sclera repair, Corneal repair, Uvea abscission, AC washout, Lens washout, IOL implanted, PPV/AV, Primary evisceration, Primary enucleation, Removal of FB, Subsequent surgery needed, If yes specify type of subsequent surgery

**5c. Medical treatment**

Analgesics, Topical antibiotics, Systemic antibiotic, Topical steroids, Systemic steroids

Mydriatics, IOP lowering drugs, Protective eye wear, antifungal, antiviral

**POST TREATMENT COMPLICATIONS**

Loose corneal sutures, Corneal opacity, Irregular pupil, Posterior synechia, Seclusio/occlusion pupil, Cataract, PCO, Glaucoma, Decentered IOL, Hyphaema, Uveitis, Endophthalmitis, Phthisis, Refraction, Amblyopia therapy, Other (specify) .....

**VA at follow up:**

Done = 1; Not done = 0

If done specify below, please

Period post treatment	Snellen Chart	Lea Chart
Within 2 weeks		
Up to 3 months		
Up to 6 months		
Up to 1 year		
Up to 2 years		

THANK YOU

## APPENDIX V: WHO CLASSIFICATION OF BLINDNESS

Category	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 VI: 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 VII: OCULAR TRAUMA CLASSIFICATION, TERMINOLOGY, DEFINITION AND EXPLANATION

**Eyewall:** sclera and cornea

For clinical and practical purposes, violation of the most external structures of the eyewall is considered even though there are anatomically 3 coats posterior to the limbus.

**Closed globe injury:** Absence of full-thickness wound of the eyewall.

**Open globe injury:** Presence of full-thickness wound of eyewall.

**Contusion:** No apparent wound but the injury may be due to a direct energy delivered by the object (e.g., choroidal rupture) or the changes in the shape of the globe (e.g., angle recession).

**Lammellar laceration:** Partial thickness wound of the eyewall.

**Rupture:** full-thickness wound of the eyewall due to a blunt object. A blunt impact results in a brief sudden increase in IOP because it is filled with an incompressible liquid. It gives way at its weakest point at the impact site or elsewhere with the actual wound produced by an inside-out mechanism.

**Laceration:** full-thickness wound of the eyewall due to a sharp object. The wound occurs at the impact site by an outside-in mechanism.



**Penetrating injury:** Entrance wound: More than one wound is present with each one caused by a different agent.

**Retained foreign body(ies):** primarily, a penetrating injury, but due to its different clinical implications, it is grouped separately.

**Perforating injury:** Entrance and Exit wounds: the same agent must have caused both wounds.

In the presence 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.