

Eye Injuries Causes And Complications Among Adult Population At An Ambulatory Eye Center: A Case Of Nyamira County Referral Hospital Eye Unit, Kenya.

¹Dennis Atunga Barake, ²Alloysius Luambo Omoto, ³George Muthui, ³Peter Koome Mutuma

Nyamira County Referral Hospital, Eye Department, Nyamira, Kenya

German Doctors- Baraka Healthnet, Eye Unit, Nairobi, Kenya

Jomo Kenyatta University of Agriculture And Technology, Department Of Clinical Medicine, Juja, Kenya

Abstract

Introduction: Worldwide 1.6million people are blind secondary to eye injuries, 2.3 million with low visual acuity bilaterally and 19 million with unilateral blindness or low vision. Ocular injuries are increasingly becoming the permanent cause of blindness. Visual impairment and blindness are most often the result of complications from eye injuries.

Objectives: To determine eye injuries causes and complications among adult population at an ambulatory eye center: a case of Nyamira County Referral Hospital Eye unit, Kenya.

Methodology: A cross-sectional study design was used on adults' population seeking care at Nyamira county referral hospital in rural Kenya. A sample size of 217 participants was anticipated. Systematic random sampling method was used in attaining 100% of the projected sample population. Ethical protocols were observed with approval from JKUAT-Ethical research committee, patient consent and hospital administration permission. Structured questionnaires were used in data collection. Data generated was analyzed using SPSS version 25 and presented using visualization techniques.

Results: There was attainment of 100% research participants, out of the projected 217 participants, 76.50% (166 respondents) were males and 23.50% (51 respondents) were females. Majority of the respondents, 32.3% were in the age group 27-35 years with 36% of the eye injuries in this age group resulting from mechanical causes. The most common cause of eye injury was mechanical (62.67%) then chemical (21.2%). Cataract (20.75%) was the most common complication affecting more males (84%) than females (16%). Followed by corneal scars (18.31%), Enucliation (1.23%) was the least frequent complication. Most people (70%) involved in manual related jobs had partial loss of vision while Students and those who were working in office set up represented 14.46%.

Conclusion and recommendations: Mechanical causes (62.67%) results to more eye injuries than any other causes. Ministry of labor should offer occupational health education and enforce laws that dictate employers to provide proper eye protective equipment like goggles to those in eye injury prone professions. Cataract (20.75%) is the commonest eye injuries complication. Occupational health trainings should be offered to workers. County governments in Kenya should invest in cataract surgical equipment and supplies that will restore eyesight to those presenting with traumatic cataract.

Date of Submission: 21-01-2025

Date of Acceptance: 31-01-2025

I. Introduction

Background

The eye comprises of the globe and non-globe tissue. Globe represents the eyeball while non-globe tissue includes eyelids, lacrimal system and orbit. Eye injury is any permanent or semi-permanent disturbance of structure or function of any part of eye tissue caused by any of the five forms of physical energy namely mechanical, chemical, radiation, electrical and thermal (Fasika Woreta, MD, 2019). A World Health Organization report noted that 55 million eye injuries that restricted activity for longer than one day occurred each year, 750,000 persons required hospitalization each year for eye injuries, including some 200,000 with open-globe injuries, and about 1.6 million were blinded by injuries, 2.3 million had poor bilateral vision after eye injuries, and almost 19 million had unilateral blindness or low vision after eye injuries (Lee et al., 2020). The common types of eye injuries that most people encounter are corneal abrasions whereby abrasions occur on to the eye's surface, it involves getting poked or rubbing the eye especially when foreign body e.g. sand is

present. Stones and sharp objects were the most common causes of eye injury accounting for 18.1% and 17.2% respectively in children (Al-Bdour & Azab, 1998). Another common cause of eye injuries are chemical spills like caustic foreign substance in the eye. It occurs when one can get splashed or sprayed in the eye by substances other than clean harmless water. Skin/eye chemical splashes are a significant workplace problem (Hall & Maibach, 2006).

Eye injuries usually present with the cardinal signs of inflammation. Eye swelling is also the most common complication that can result from being struck by blunt object leading to puffy and swollen eye lids. A research done in northern Iran showing the most common ophthalmologic symptoms of redness, 30% (259) of the patients were having swelling of the eye lids or edema (Farokhfar et al., 2015). Subconjunctival hemorrhages involve leakage of blood from one of more breaks in blood vessels that lies between the sclera and the conjunctiva, they are very common and can arise from minor injuries or non-traumatic factors. A study done in Congo 61(0.8%) of the patients were having subconjunctival hemorrhage out of 6843 consulting patients (Kaimbo Wa Kaimbo, 2009). Other presentations are hyphaema, hyphema is bleeding into the anterior chamber of the eye, space between the cornea and the iris. Most common cause of hyphema was projectile toy (Taqi Al Saffar et al., 2017). Based on the injury to the eyeball, of the eye consisting of the cornea and sclera, eye injuries can be classified into two. Closed globe injuries and open globe (Kuhn et al., 2002).

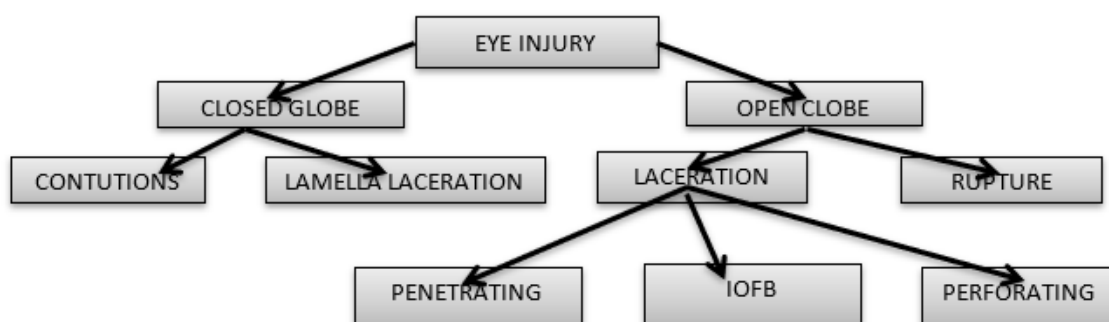


Figure 1. Classification of eye injuries (Jafari et al., 2012).

Statement of the Problem

Eye injuries and their associated disabilities remain a common problem throughout the world. In developing countries, ocular injuries occur more frequent than they are reported, and their prevalence among eye patients is high. In Nyamira County Referral Hospital, there is lack of data for the causes and complications of eye injuries despite so many clients with eye injuries being treated at the eye unit. Eye injuries are very common and the actual causes of the injuries remain unknown too as they have not been documented. There is also an increase in the number of cases of blindness among the residents in the area of study. Therefore, there was a need to conduct this study to determine and the causes and complication of eye injuries in Nyamira County Referral Hospital. These results also add to literature as far as eye injuries are concerned.

Justification of study

This study will provide data on the causes and complications of eye injuries. The information will be used to plan for interventions in healthcare settings. The information will also be used to modify existing policy on eye care. The study identified treatable eye injuries which are offered at the eye department in Nyamira County Referral Hospital.

Broad objectives

To determine eye injuries causes and complications among adult population at an ambulatory center: a case of Nyamira Referral Hospital Eye unit, Kenya.

Specific objectives

1. To determine the causes of eye injuries among adults patients attending eye clinic in Nyamira County Referral Hospital.
2. To evaluate the complications of eye injuries among adult patients attending eye clinic in Nyamira County Referral Hospital

II. Literature Review Summary

- Worldwide 1.6million people are blind secondary to eye injuries, 2.3 million with low visual acuity bilaterally and 19million with unilateral blindness or low vision. Higher rates of ocular injuries in young adults have been observed consistently in nearly all studies (Négrel, 1997).
- Visual impairment and blindness are most often the result of complications from eye injuries (such as secondary infections or sympathetic ophthalmia). An estimate of global incidence of eye injuries of 950/100000 population restricting activities for more than one day; this implies an annual incidence of 55 million injuries of these kind.
- The most common presentation of eye injury was hyphema (78%), abnormality of the pupil or uvea (94%). There are multiple complications which occur following eye injury and they include: corneal scarring, hyphema, iridodialysis, post traumatic glaucoma, uveitis, cataract, vitreous hemorrhage and retinal detachment (Mokdad et al., 2016).

III. Methodology

Study design

This study was a descriptive cross-sectional study.

Study location

Nyamira County Referral Hospital is located in Township Sub-Location, Bonyamatuta Chache locations, Nyamira Division, West Mugirango Constituency in Nyamira county. Nyamira county is a county in the former Nyanza Province of Kenya. It is also called North Kisii County. The main economic activity is agriculture. The county has an area of 912.5km², and a population of 598,252. Its biggest town is Nyamira. Nyamira county referral hospital is the biggest government medical referral institution in the region with 200 bed capacity. The services offered are preventive, curative, promotive and rehabilitative services.

Study period

January 2017 to December 2017

Study Population

Nyamira County Hospital Eye clinic attends 20 to 30 patients per day leading to an average of 500 patients per month therefor this was the study population. The study population included all patients who attended Nyamira County Hospital Eye Clinic within a period of one month and a diagnosis of eye injury was made. Patients who had experienced eye injuries there before but visited the eye clinic during the period of study were also interviewed.

Sample Size

The sample size was calculated using Fisher et al formula.

$$n = \frac{Z^2 Pq}{d^2}$$

Since the prevalence of ocular injuries in Nyamira Region populations is unknown, the assumed prevalence (proportion P) in the population was estimated at 50%. The desired precision (d) for the study was assumed to have a sampling error of 5% and the power of the study was fixed at 0.95 (for 95% confidence limits).

Therefore the minimum sample size (n) in this cross-sectional study needed to give sufficient power using the above formula is as follows

Where;

P = Estimated proportion 50% i.e. 0.5(wen expressed in decimals)

d = Desired precision 5% i.e. 0.05(wen expressed in decimals)

n = Sample size

Z = 1.96, Standardized normal deviate to give 95% confidence limits.

q = (1-p). (Expressed in decimals)

n= (1.96)²(0.5) (0.5)/(0.05)² =384, as per fisher's population if the sample size of the study population is less than 10000 persons.

Since the study population is less than 10000, the second formula was used to calculate the sample size. (Fisher *et al*, 1998).

$$nf = \frac{n}{1 + (\frac{n}{N})}$$

Where $nf = \frac{384}{1 + (\frac{384}{500})} = 384/1.768$
 Sample size =217

Sampling Method

A systematic sampling method was used. Since the population is 500 and the calculated sample size is 217, then the sample interval is $500/217 = 2.304$. Therefore sample interval was every second member of the sampling frame and was included in the study.

Inclusion Criteria

All patients of consenting age, who attended Nyamira County Referral Hospital Eye Clinic within a period of study and presented with current or previous eye injuries.

Exclusion Criteria

Patients attending who not give consented to participate in the study

Data Collection and Management

Data collection was conducted through an interview to get the primary data. The researcher identified and trained interviewers on data collection prior to material day. They were sensitized on accuracy and confidentiality of each response from the interviewee and the need for questionnaires and data security by use of serial numbers. A pre-test was conducted to access the interviewer’s preparedness and credibility of the questionnaires. Both open ended and closed ended questions were used.

Data Analysis and Presentation

The qualitative and quantitative data collected was analyzed using descriptive statistics using SPSS version 21.0. Different causes of eye injuries were analyzed and presented as percentage. In addition, complications were analyzed and presented as proportions. Data was presented in form of graphs, bar charts, pie charts, histograms and tables.

Confidentiality

Informed consent was obtained from all participants with the reassurance that the study could not harm them in any way, and that all the information obtained could be handled with strict confidentiality. The right to participate in the study or not, rested with the respondents and remain respected thought the study. The respondents were assured that these could not affect the care they were going to receive.

Ethical Approval

Ethical approval was sought from Jomo Kenyatta University of Agriculture And Technology Ethics and Research Committee (JKUAT-ERC). Permission was also sought from Nyamira County Referral Hospital to undertake the study.

IV. Results

Respondents’ Characteristics

There was attainment of 100% research participants, out of the projected 217 participants, 76.50% (166 respondents) were males and 23.50% (51 respondents) were females.

Age of Respondents

Majority of the respondents, 32.3% were in the age group 27-35 years of age while only 6% were 72 years and above as shown in Table 4.1.1 below.

Age group	Frequency(f)	Percent	Cumulative Percent
18-26years	57	26.3	26.3
27-35years	70	32.3	58.5
36-44years	23	10.6	69.1
45-53years	15	6.9	76.0
54-62years	19	8.8	84.8
63-71years	20	9.2	94.0
72years and above	13	6.0	100.0
Total	217	100.0	

Age of the respondent and various eye injuries causes.

Mechanical injuries were more among age group 35-27 having 36%. Electrical injuries were the least recorded in most age groups as seen in table 4.1.2 below.

Table 4.1.2 showing age of respondent and causes of injury

		Cause of Injury					Total
		Mechanical	Chemical	Radiations	Electrical	Thermal	
Age	18-26years	34	9	3	1	10	57
		25.0%	19.6%	20.0%	50.0%	55.6%	26.3%
	27-35years	49	11	6	1	3	70
		36.0%	23.9%	40.0%	50.0%	16.7%	32.3%
	36-44years	12	8	3	0	0	23
		8.8%	17.4%	20.0%	0.0%	0.0%	10.6%
	45-53years	6	6	1	0	2	15
		4.4%	13.0%	6.7%	0.0%	11.1%	6.9%
54-62years	12	5	1	0	1	19	
	8.8%	10.9%	6.7%	0.0%	5.6%	8.8%	
63-71years	14	5	1	0	0	20	
	10.3%	10.9%	6.7%	0.0%	0.0%	9.2%	
72years and above	9	2	0	0	2	13	
	6.6%	4.3%	0.0%	0.0%	11.1%	6.0%	
Total		136	46	15	2	18	217
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Causes Of Injury Eye Injury

The most common cause of injury was mechanical (62.67%).

The second one was chemical (21.2%). Third were thermal injuries (8.3%). Fourth were radiations (6.9%). Electrical injuries were the least (0.92%) as shown in the pie chart 4.3.1 below.

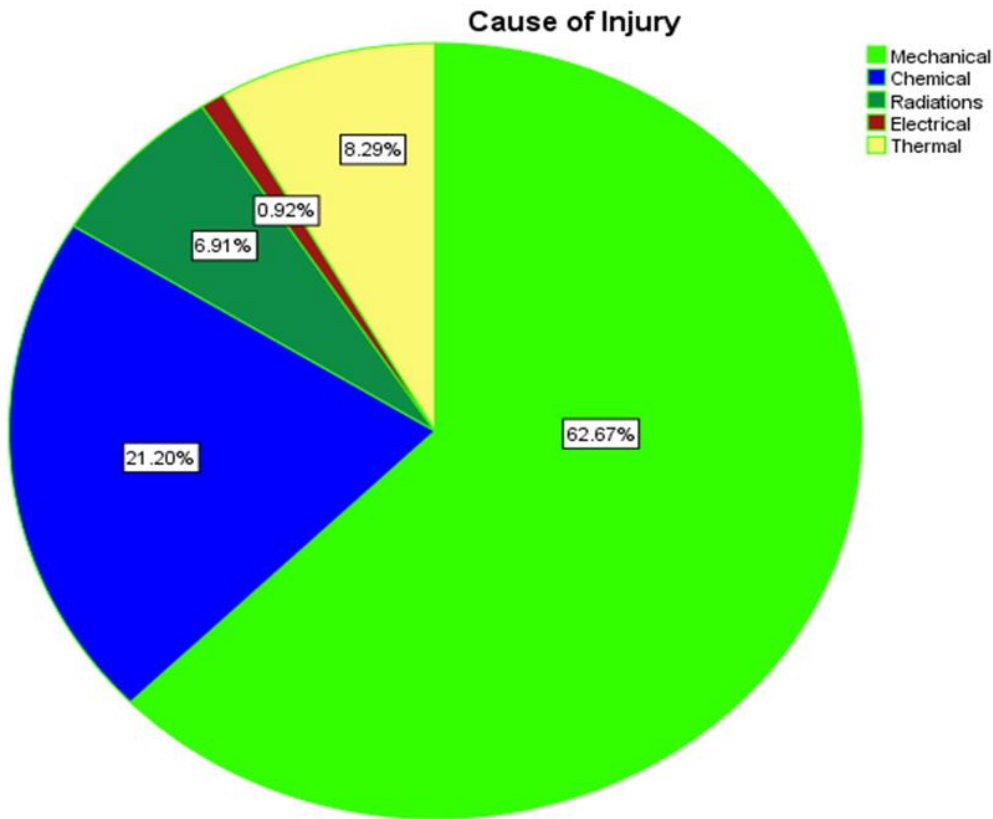


Figure 4.3.1 Pie chart showing the various causes of eye injuries.

Complications Of Eye Injuries

Cataract was the most frequent complication with a frequency of 100 cases representing 20.75%. Corneal scars were second with frequency of 89(18.31%). Removal of the eye (enucleation) was the least frequent complication with frequency of 6 representing 1.23% as seen in the bar chart below.

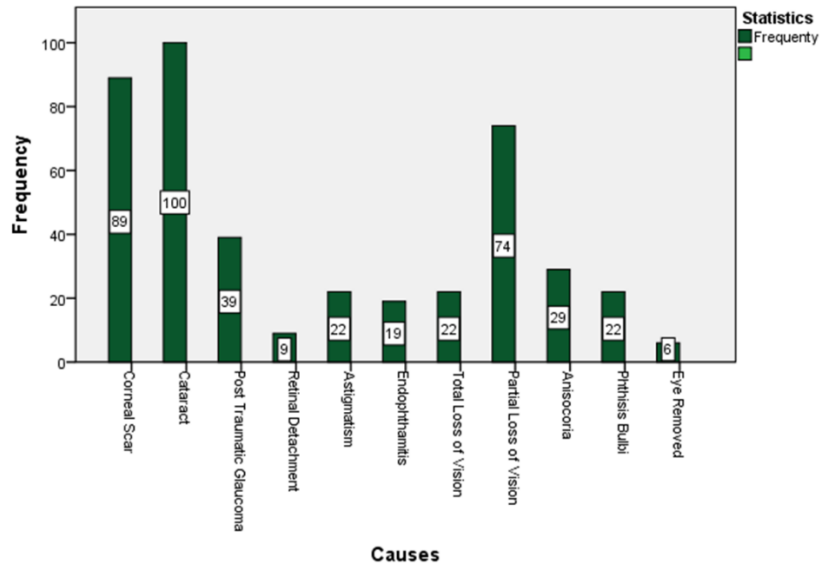


Figure 4.5 showing frequency of various complications

Corneal Scar

Mechanical causes were the leading by 69% followed by chemical causes 16%. Electrical injuries were the least by 0.00% as seen in the Figure 4.51 below.

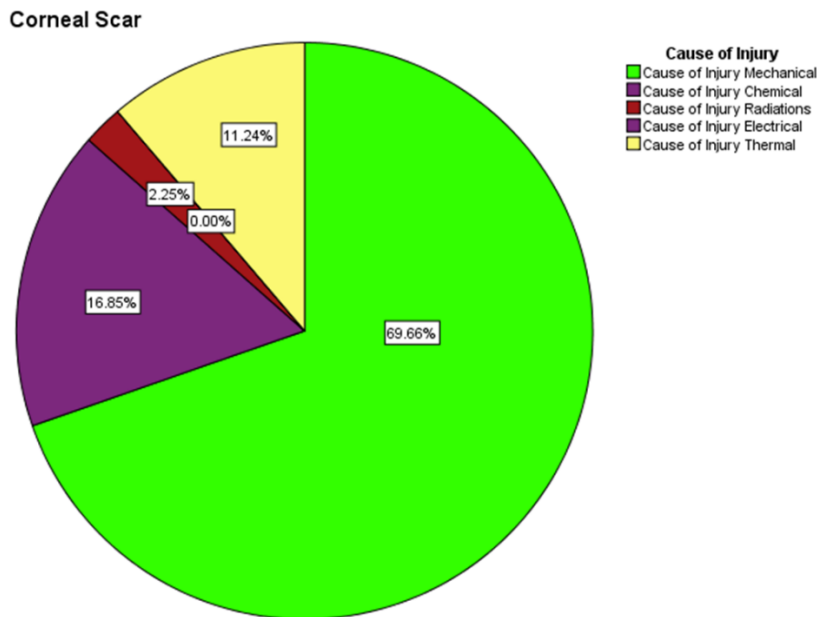


Figure 4.5.1 Pie chart showing various causes of eye injury causing corneal scars

Cataract

Males (84%) were affected more than Females (16%). Cataracts were more in respondents who had only one eye involved in an injury represented by 68% while those with both eye involved had 32%. Mechanical causes were the leading cause of cataract affecting 77% of the cases, followed by radiating injuries (13%, chemical injuries (8%). No thermal injury was recorded to have caused cataract as seen in Figure; 4.5.2 below

Cause of cataract in terms of percentage

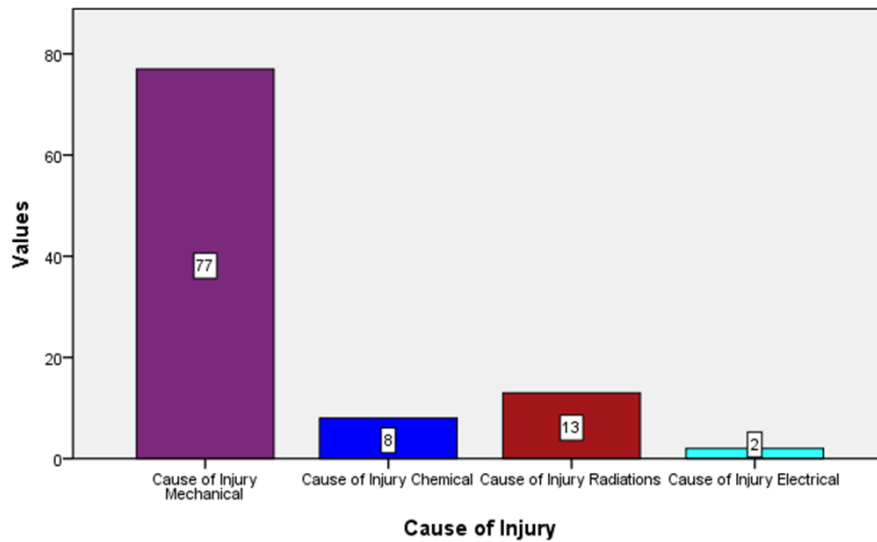


Figure 4.5.2 Bar chart showing percentage of various causes of traumatic cataract

Partial Loss of vision

Most of the people who were doing manual related jobs had partial loss of vision and they represented 70% while Students and those who were working in office represented 14.46%. Mechanical causes were the leading with 62.16% followed by chemical causes 18.92%. Electrical causes were the least as seen in Figure; 4.5.3 below.

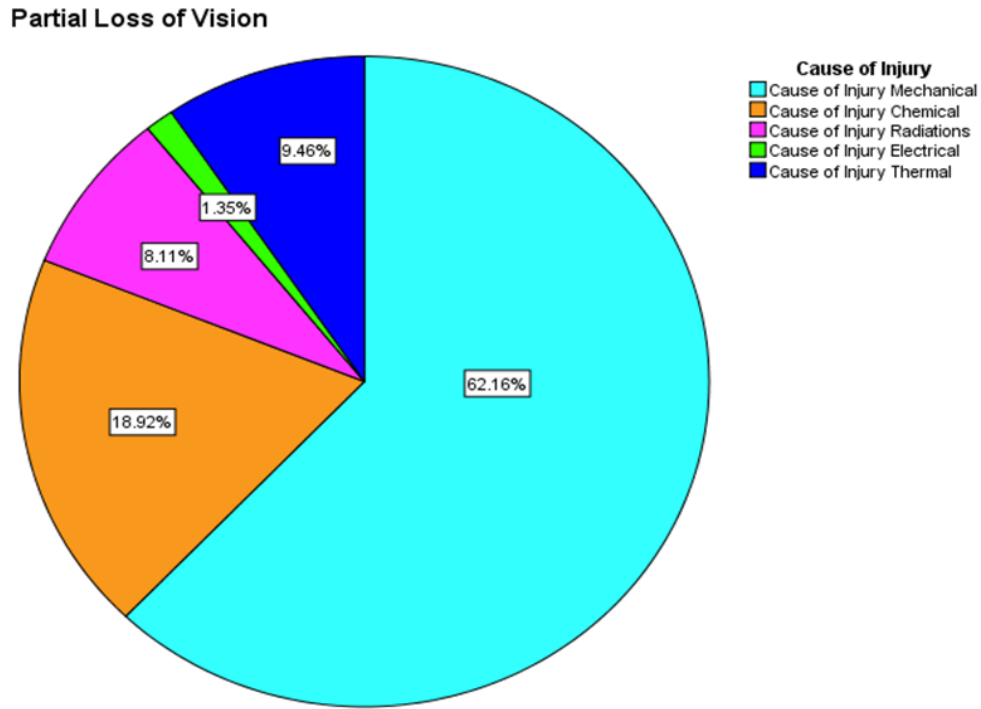


Figure 4.5.3 pie chart showing various causes leading to partial loss of vision.

Post traumatic glaucoma and diagnosis made

There were more cases of post traumatic glaucoma in open eye injuries 29 (13.36%) as seen in the line Figure 4.6.1 below. Most of the open eye injuries were from respondents who were doing manual related work 66.7% as seen in Table 4.6.1. In open eye injuries mechanical causes were the leading by 50.7%, electrical injuries were least by 0.0% whereby in closed eye injuries, chemical causes were the leading by 17.7% as shown in Table 4.6.2.

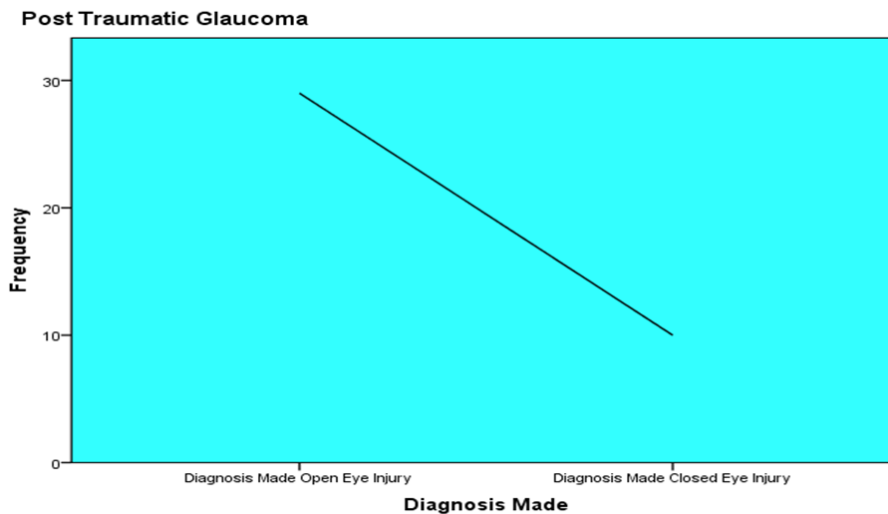


Figure 4.6.1 Line graph showing the post traumatic glaucoma and diagnosis made.

Table 4.6.1 Diagnosis Made and Occupation of Respondent						
		Occupation of Respondent			Total	
		Manual related work	Office related work	Student		
Diagnosis Made	Open Eye Injury	108	8	3	119	
		66.7%	27.6%	12.5%	55.3%	

	Closed Eye Injury	54	21	21	96
		33.3%	72.4%	87.5%	44.7%
	Total	162	29	24	215
		100.0%	100.0%	100.0%	100.0%

Table 4.6.2 Cause of Injury and Diagnosis Made

		Diagnosis Made		Total
		Open Eye Injury	Closed Eye Injury	
Cause of Injury	Mechanical	109	27	136
		91.6%	28.1%	63.3%
	Chemical	7	38	45
		5.9%	39.6%	20.9%
	Radiations	1	13	14
		0.8%	13.5%	6.5%
Electrical	0	2	2	
	0.0%	2.1%	0.9%	
Thermal	2	16	18	
	1.7%	16.7%	8.4%	
Total		119	96	215
		100.0%	100.0%	100.0%

V. Discussion

There were 217 participants in this study; the modal age group was 27-35 years with a frequency of 70 study participant. This is can be explained by the fact that, this age group are the most productive economically and are mostly engaged in manual related work. The same scenario was synonymous to a Nigerian study, in Ibadan hospital where, ocular injury was most frequent in the 20-29 years group (31.9%) followed by the 0-9 years age group (31.1%) (Oluyemi, 2011). Age group of 72years and above had the least frequency of 13 representing 6% of the total patients interviewed. This is because most elderly people in rural Africa are neglected and usually don't have anybody to accompany them to the hospital. However these is contrary to a study that was done in the USA whereby it was found that 66 years and older patients were found to be more vulnerable to ocular injuries(Stitzel et al., 2005).

Most of the patients who presented with eye injuries were those doing manual related works (75.58%) followed by office works (13.36%) then students (11.06%). Most of the people doing manual works are vulnerable to eye injuries due to the kind of work they do and being subjected to various movements in their area of work. Most of the patients who were interviewed reported to be agricultural workers in their farms. This was in agreement with a research that was done in Bosnia and it was found that, agricultural workers were eight times more likely to experience work-related eye injury (95%)(Jovanovic et al., 2016). Injuries affecting students presented with 11.06%. These was contrary to a research done in Nigeria whereby it was found that primary school children in Enugu Nigeria, showed more females, 652 (52.8%), than males, 584 (47.2%), in the sampled population. Children who admitted to have had at least one episode of an eye injury by questionnaire were 36.7%. The inference from this was that of a high prevalence of probably minor eye trauma among these children (Okpala et al., 2015).

The leading cause of injury was mechanical with 136 (62.67%) patients followed by chemical causes 46 (21.2%), thermal 18 (8.3%), radiations 15 (6.9%) and electrical 3(0.9%) respectively. These is in agreement with research that was done in Tanzania and it was found that a total of 157 cases which were recorded, of whom 69% were male. A third of the injuries occurred in those less than age 20. Injury with a stick was the most common cause, accounting for 67% of the cases (Abraham et al., 1999). A similar study was performed to determine the epidemiology and incidence of ocular trauma in Waikato, New Zealand, it was also found that out of 821 total injuries, most frequent causes of eye injuries in men were related to outdoor activities (25.9%) and manual work (20.7%) (Pandita & Merriman, 2012). Mechanical injuries were more in male that female.

In all the 217 patients who were interviewed cataract was the most common complications with a frequency of 100 (20.57%) followed by corneal scars presenting with 89(18.31%) frequency. Third was partial loss of vision with a frequency of 74 (15.22%), then followed by anisocoria 29 (5.96%). Astigmatism and phthisis bulbi had same frequency of 22 (4.5%). The complication that presented least was eye removal with a frequency of 6 (1.2%). These finding was in agreement with a study that was done in retrospective review of 235 patients with open-globe injuries at the Massachusetts Eye and Ear Infirmary whereby vision-limiting complications were assessed at 2 to 3 months after the injury. It was elucidated that traumatic cataracts were the most common vision-limiting factor in all subcategories of open-globe injuries. Injuries in zones II and III and blunt-force ruptures were associated with increased rates of retinal detachments, phthisis, and enucleation, contributing to the poorer visual prognosis in these patients (Thakker & Ray, 2006).

Mechanical injuries were the leading cause of open eye injuries 109 (91.59%). In closed injuries mechanical causes were 27 (28.12%). Chemical causes were 38 (17.15%) in closed eye injuries and 7 (3.22%)

in open eye injuries. Radiation causes were 13 (5.99%) in closed injuries and 1 (0.4%) in open eye injuries. No electrical cause was associated with open eye injury but 2 (0.9%) cases were present in closed eye injuries. Thermal causes were 16 (7.37%) in closed eye injuries and 2 (0.9%) in open injuries. These were in agreement with a research that was done in Waikato New Zealand where it was found that there was a significant difference in the frequency of open and closed globe injuries in work-related injuries (58% open vs 42% closed) whereby most of the work evaluated was manual related work (Pandita & Merriman, 2012).

Males were 166(76.49%) more affected than females who were 51(23.5%). In electrical injuries the number of males affected was equal to female with a ratio of 1:1. In chemical injuries males were 28(12.9%) and female 18 (8.75%), thermal injuries males were 11(5.06%) and female 7(3.22%). In radiation injuries males were 10(4.6%) and female 5 (2.3%). This was because males are used to do more manual related work than females. This was in agreement with a research that was done in New Zealand whereby Men had higher rate of ocular trauma than women (74% vs 26%) (Pandita & Merriman, 2012).

VI. Conclusion

- 1 Mechanical causes (62.67%) result in more eye injuries than any other causes.
- 2 Cataract (20.75%) is the commonest eye injury complication.

VII. Recommendations

- 1 Kenya Ministry of labor should offer occupational health education and enforce laws that dictate employers to provide proper eye protective equipment like goggles to those in eye injury-prone professions. Occupational health trainings should be offered to workers.
- 2 County governments in Kenya should invest in cataract surgical equipment and supplies that will restore eyesight to those presenting with traumatic cataract.

References

- [1] Abraham, D., Vitale, S., West, S., & Isseme, I. (1999). Epidemiology Of Eye Injuries In Rural Tanzania. *Ophthalmic Epidemiology*, 6(2), 85–94. <https://doi.org/10.1076/Opep.6.2.85.1560>
- [2] Al-Bdour, M. D., & Azab, M. A. (1998). Childhood Eye Injuries In North Jordan. *International Ophthalmology*, 22(5), 269–273. <https://doi.org/10.1023/A:1006335522435>
- [3] Farokhfard, A., Dailami, K. N., Gorji, M. A. H., & Aghaie, N. (2015). Epidemiology And Symptoms Of Red Eyes In Patients From Northern Iran. *Journal Of Natural Science, Biology And Medicine*, 6(2), 369–371. <https://doi.org/10.4103/0976-9668.160009>
- [4] Fasika Woreta, MD, M. (2019). Eye Trauma - Symptoms, Diagnosis And Treatment | BMJ Best Practice US. <https://bestpractice.bmj.com/topics/en-gb/961>
- [5] Hall, A. H., & Maibach, H. I. (2006). Water Decontamination Of Chemical Skin/Eye Splashes: A Critical Review. *Cutaneous And Ocular Toxicology*, 25(2), 67–83. <https://doi.org/10.1080/15569520600695520>
- [6] Jafari, A., Bozorgui, S., Shahverdi, N., Ameri, A., Akbari, M. R., & Salmasian, H. (2012). Different Causes Of Referral To Ophthalmology Emergency Room. *Journal Of Emergencies, Trauma And Shock*, 5(1), 16–22. <https://doi.org/10.4103/0974-2700.93104>
- [7] Jovanovic, N., Peek-Asa, C., Swanton, A., Young, T., Alajbegovic-Halimic, J., Cavaljuga, S., & Nisic, F. (2016). Prevalence And Risk Factors Associated With Work-Related Eye Injuries In Bosnia And Herzegovina. *International Journal Of Occupational And Environmental Health*, 22(4), 325–332. <https://doi.org/10.1080/10773525.2016.1243081>
- [8] Kaimbo Wa Kaimbo, D. (2009). Epidemiology Of Traumatic And Spontaneous Subconjunctival Haemorrhages In Congo. *Bulletin De La Société Belge D'ophtalmologie*, 311, 31–36. <https://pubmed.ncbi.nlm.nih.gov/19621552/>
- [9] Kuhn, F., Morris, R., & Witherspoon, C. D. (2002). Birmingham Eye Trauma Terminology (BETT): Terminology And Classification Of Mechanical Eye Injuries. In *Ophthalmology Clinics Of North America* (Vol. 15, Issue 2, Pp. 139–143). *Ophthalmol Clin North Am*. [https://doi.org/10.1016/S0896-1549\(02\)00004-4](https://doi.org/10.1016/S0896-1549(02)00004-4)
- [10] Lee, J. S., Chen, W. M., Huang, L. H., Chung, C. C., Yu, K. H., Kuo, C. F., & See, L. C. (2020). Epidemiology Of Outpatient And Inpatient Eye Injury In Taiwan: 2000, 2005, 2010, And 2015. In *Plos ONE* (Vol. 15, Issue 7). Public Library Of Science. <https://doi.org/10.1371/journal.pone.0235208>
- [11] Mokdad, A. H., Forouzanfar, M. H., Daoud, F., Mokdad, A. A., El Bcheraoui, C., Moradi-Lakeh, M., Kyu, H. H., Barber, R. M., Wagner, J., Cercy, K., Kravitz, H., Coggeshall, M., Chew, A., O'Rourke, K. F., Steiner, C., Tuffaha, M., Charara, R., Al-Ghamdi, E. A., Adji, Y., ... Murray, C. J. L. (2016). Global Burden Of Diseases, Injuries, And Risk Factors For Young People's Health During 1990–2013: A Systematic Analysis For The Global Burden Of Disease Study 2013. *The Lancet*, 387(10036), 2383–2401. [https://doi.org/10.1016/S0140-6736\(16\)00648-6](https://doi.org/10.1016/S0140-6736(16)00648-6)
- [12] Négrel, A. D. (1997). Community Eye Health Journal » Magnitude Of Eye Injuries Worldwide. In *Community Eye Health* (Vol. 10, Issue 24, Pp. 49–53). <https://www.cejjournal.org/article/magnitude-of-eye-injuries-worldwide/>
- [13] Okpala, N. E., Umeh, R. E., & Onwasigwe, E. N. (2015). Eye Injuries Among Primary School Children In Enugu, Nigeria: Rural Vs Urban. *Ophthalmology And Eye Diseases*, 7, OED.S18659. <https://doi.org/10.4137/Oed.S18659>
- [14] Oluyemi, F. (2011). Epidemiology Of Penetrating Eye Injury In Ibadan: A 10-Year Hospital-Based Review. In *Middle East African Journal Of Ophthalmology* (Vol. 18, Issue 2, Pp. 159–163). Wolters Kluwer -- Medknow Publications. <https://doi.org/10.4103/0974-9233.80706>
- [15] Pandita, A., & Merriman, M. (2012). Ocular Trauma Epidemiology: 10-Year Retrospective Study. *New Zealand Medical Journal*, 125(1348), 61–69. <https://pubmed.ncbi.nlm.nih.gov/22282278/>
- [16] Stitzel, J. D., Hansen, G. A., Herring, I. P., & Duma, S. M. (2005). Blunt Trauma Of The Aging Eye: Injury Mechanisms And Increasing Lens Stiffness. *Archives Of Ophthalmology*, 123(6), 789–794. <https://doi.org/10.1001/archoph.123.6.789>

- [17] Taqi Al Saffar, A. A., Hussein, A. S., & Jamal, N. M. (2017). Traumatic Hyphema Frequency And Management Evaluation: A Retrospective Study. *Health Science Journal*, 11(1). <https://doi.org/10.21767/1791-809x.1000481>
- [18] Thakker, M. M., & Ray, S. (2006). Vision-Limiting Complications In Open-Globe Injuries. *Canadian Journal Of Ophthalmology*, 41(1), 86–92. [https://doi.org/10.1016/S0008-4182\(06\)80074-8](https://doi.org/10.1016/S0008-4182(06)80074-8)