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Research Article

Visual Outcome and Complications of Age Related Cataract Surgery at Mbingo Baptist Hospital Eye Unit, North West Region, Cameroon

Beyiah Kamsang Pius[1]*, Mukiri Mukuria[2], Lucy Njambi[2] and Marvice Okwen[1]

[1]*Mbingo Baptist Hospital, Cameroon*

[2]*Department of Ophthalmology, University of Nairobi, Kenya*

***Corresponding Author:** Beyiah Kamsang Pius, Mbingo Baptist Hospital, North West Region, Cameroon.

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Abstract

Objective: The overall objective was to assess the outcome of age related cataract surgery at Mbingo Baptist Hospital, Eye Unit, and North West Region, Cameroon from the 1st January 2014 till 31st of December 2014

Methods: This was a retrospective hospital based case series conducted at Mbingo Baptist Hospital, Eye Unit, and North West Region, Cameroon. Data was abstracted from files of patients 40 years old and above, who had undergone cataract surgery for age related cataract. The data was captured using a data collection tool and analyzed using STATA Version 20.0. Descriptive and univariate analysis was carried out.

Results: Of the 230 files analyzed 82.2% of eyes were blind and 3.5% had severe visual impairment preoperatively. The uncorrected visual acuity was 6/18 or better in 2.3% eyes on day one and improved to 10.2% eyes at 4 - 6 weeks. The uncorrected visual acuity was less the 6/60 in 30.3% of eyes on day one and reduced to 20.4% eyes at 4 - 6 weeks. Only 6% of the eyes had refraction done. All the eyes had biometry done. Intraoperative complication rate was 13% with vitreous loss accounting for 4.3%. At 4 - 6 weeks post-operatively the major cause of poor outcome was ocular comorbidity and found to be statistically significant (p-value 0.040).

Conclusion: Uncorrected visual acuity at 4 - 6 weeks was below the WHO bench mark and ocular comorbidity was a major cause of poor outcome.

Recommendations: Provide a wide variety of IOL powers and refraction should be made as a rule for all patients with provision of affordable spectacles for those with refractive errors. Device ways to improve patient follow.

Keywords: *Cataract; Retrospective Review; Visual Outcome; Comorbidity; complications*

Abbreviations

AC IOL: Anterior Chamber Intraocular Lens; AMD: Age Related Macula Degeneration; BCVA: Best Corrected Visual Acuity; CCC: Continuous Curvilinear Capsulorrhexis; DM: Diabetes Mellitus; ECCE: Extra-Capsular Cataract Extraction; ICCE: Intra-Capsular Cataract Extraction; IOL: Intraocular Lens; IOP: Intraocular Pressure; MSICS: Manual Small Incision Cataract Surgery; PC IOL: Posterior Chamber Intraocular Lens; PC Tear: Posterior Capsule Tear; Phaco: Phacoemulsification; RACSS: Rapid Assessment of Cataract Surgical Services; SPSS: Statistical Package for Social Scientists; VA: Visual Acuity; WHO: World Health Organization

Introduction

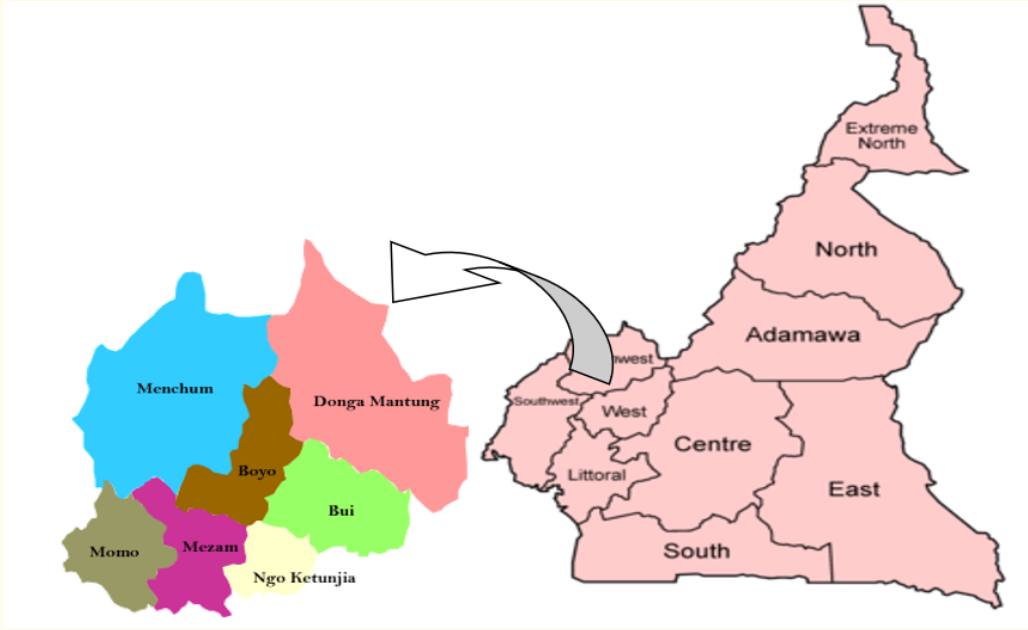
Cataract blindness accounts for 19.9 million out of 39 million people blind globally and of the 285 million people with visual impairment (visual acuity < 6/18 to ≥ 6/60 in the better eye with available correction), ninety percent reside in developing countries with

preventable causes accounting for as high as 80% [1]. From the 1990 global estimate of visual impairment it was projected that by the year 2020, seventy nine million people will become blind if no intervention is made, hence the World Health Organization/International Agency for Prevention of Blindness VISION 2020 "The Right to Sight" initiative whose main aim is to eliminate the main causes of avoidable blindness by 2020 [2].

According to the WHO, cataract is the leading cause of blindness and visual impairment throughout the world. Despite an increase in the number of people who undergo cataract surgery the visual outcome has remained poor necessitating the need for a continuous audit and which is also an essential tool in monitoring quality of cataract surgical services. This study aims at looking at the outcome of age-related cataract surgery done in this hospital by examining the visual outcome and the factors influencing visual outcome.

Materials and Methods

Study area



Figure

The study was conducted in Mbingo Baptist Hospital Eye Unit. The hospital is located in the Boyo Division, North West Region of Cameroon. It is located 37 km north of Bamenda and 366 km north of Yaoundé the capital city and somewhat accessible by tarmac and untarmacked roads to all the six divisions that make up the region and remaining nine other regions. The hospital is a regional referral hospital with an eye unit and has two resident ophthalmologist and occasionally visiting ophthalmologist and at times residents on training. About 14440 patients were seen between 1st January 2014 to 31st December 2014 and approximately 360 underwent cataract surgery.

Study design and study period

The study was a retrospective hospital based case series. The study period was from1st January 2014 to 31st December 2014.

Study population

All patients over 40 years who underwent cataract surgery at Mbingo Baptist Hospital from 1st January 2014 to 31st December 2014.

Sampling

Sample population

Patients 40 years of age and above who were seen at Mbingo Baptist Hospital, Eye Unit.

Sampling size determination

Sample size calculation was done using the following sample size formula for finite population (Lwanga SK and Lameshow S, 1991) [37].

Where

n' = sample size with finite population correction,

N = size of the target population = 360 (estimated number of cataract surgery done in Mbingo Baptist eye hospital in year 2014 from hospital registry)

Z = statistic for 95% level of confidence equal to 1.96

P = estimated outcome of age related cataract-63.4% [6]

d = margin of error = 5%

Therefore, for statistical power purposes, an estimated 178 patients would form the minimum sample size, however, all patients who meet the inclusion criteria will be recruited into study

Sampling procedure

A consecutive sampling method was used to select the patient files. Patient files were allocated serial numbers. The files were selected consecutively beginning with the first file till the total number of files were exhausted. In the course of sampling files that did not meet the inclusions criteria were discarded and next file taken.

Eligibility criteria

Inclusion criteria

Eyes of patients 40 years old and above who had age related cataract surgery at the center.

Exclusion Criteria

- Any eye with missing or incomplete records (visual acuity).
- Eyes of patients with other causes of cataract.

Data collection

Information was extracted from patient files into the questionnaire. Retrieval of files was done by an assistant. Information that was collected will include: Demographics, preoperative examination, intraoperative findings and post-operative examination. Preoperative examination included visual acuity, intra ocular pressure, biometry and ocular comorbidity. Intraoperative information included; date of surgery, surgical techniques, intraocular lens position, method of capsulotomy, use of sutures, intraoperative complications. Post-operative examination included; visual acuity day 1, 2 - 3 weeks, 4 - 6 weeks, 7 - 10 weeks, 11 weeks plus and complications after surgery.

Data management and analysis

The data collected at the end of each day be entered daily and analysis was be done by use of the Statistical Package for Social Sciences (SPSS) version 20 and with daily backups on external hard disc. Descriptive data was summarized in charts, tables and graphs. Preoperative examination, intraoperative findings and post-operative examination was summarized into proportions, means and medians as relevant. Proportionate test was used to compare the different proportions and it was done at 5% significance level (P value less than 0.05).

Data presentation

Data was presented in tables, graphs, charts. Descriptive information showed mean, frequency and proportion of various variables. Tables with univariate analysis that showed the comparison between variables with the specific *p*-value obtained.

Ethical considerations

Ethical approval

Prior to carrying out this study approval was sought from the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (KNH/UON-ERC), the management and ethics committee of the Mbingo Baptist Hospital.

Confidentiality

All data was handled with strict confidentiality in this study and shall remain so until the thesis is accepted. Nothing to identify the patient or clinician was reflected in analysed works of this study.The findings in this study will be disseminated to the faculty in the department of ophthalmology, the Mbingo hospital management board. They may also be disseminated during the August ophthalmology annual conference usually organized by the College of ophthalmology of Eastern, Central and Southern Africa. The study findings shall thereafter be put forth for publication.

Results and Discussion

A total of 233 files were retrieved out of which three had incomplete records. Two hundred and thirty files were analyzed.

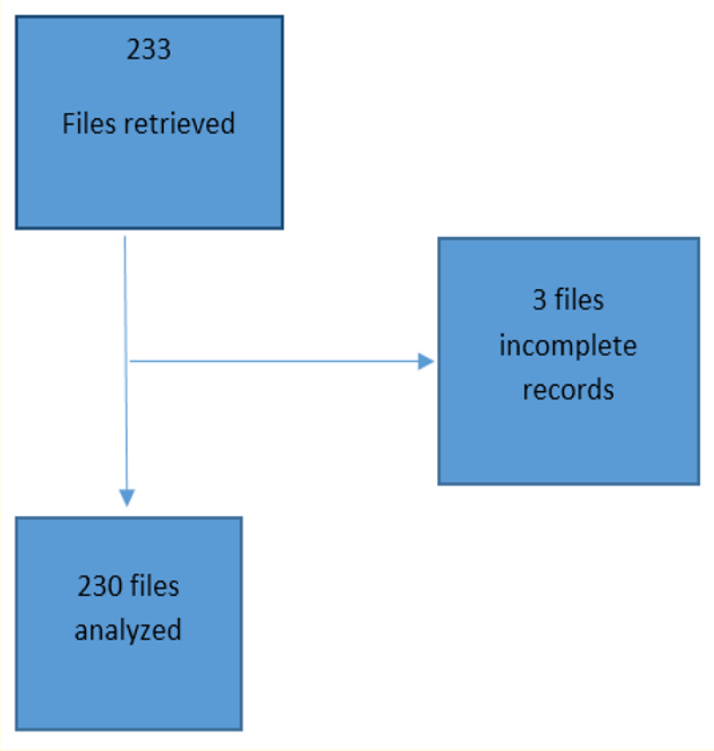


***Figure 1*:** *Flow diagram.*

Demographic data

The study targeted all patients 40 years and above who underwent cataract surgery at Mbingo Baptist Hospital from 1st January 2014 to 31st December 2014. A total of 230 eyes of 203 patients underwent surgery during this period. The commonest age group was 70 - 79 (40.9%), with 81.3% of patients over 60 years. This is shown in figure 2 and table 1 below.

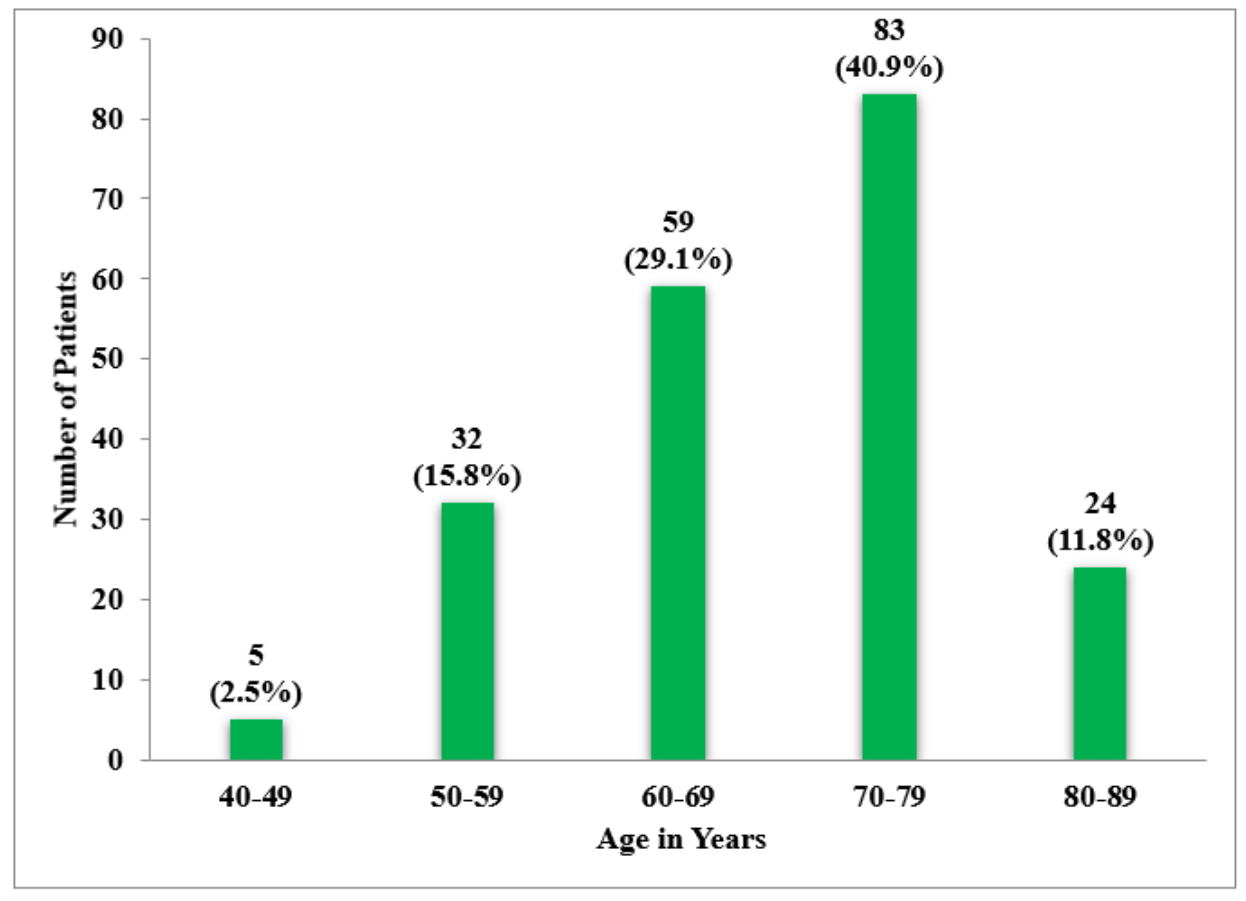


***Figure 2*:** *Distribution of study population by age (n = 203).*

Gender	Total	Mean Age (years)	Median Age (years)	Interquartile range	M:F
Male	86 (42.4%)	68	70	13	1:1.3
Female	117 (57.6%)				

Table 1: *Demographic characteristics.*

M: F = 1:1.3 (p = 1.26).

Majority of patients (93.6%) seen where from North West as most of patient tend to seek medical attention in their respective district hospitals.

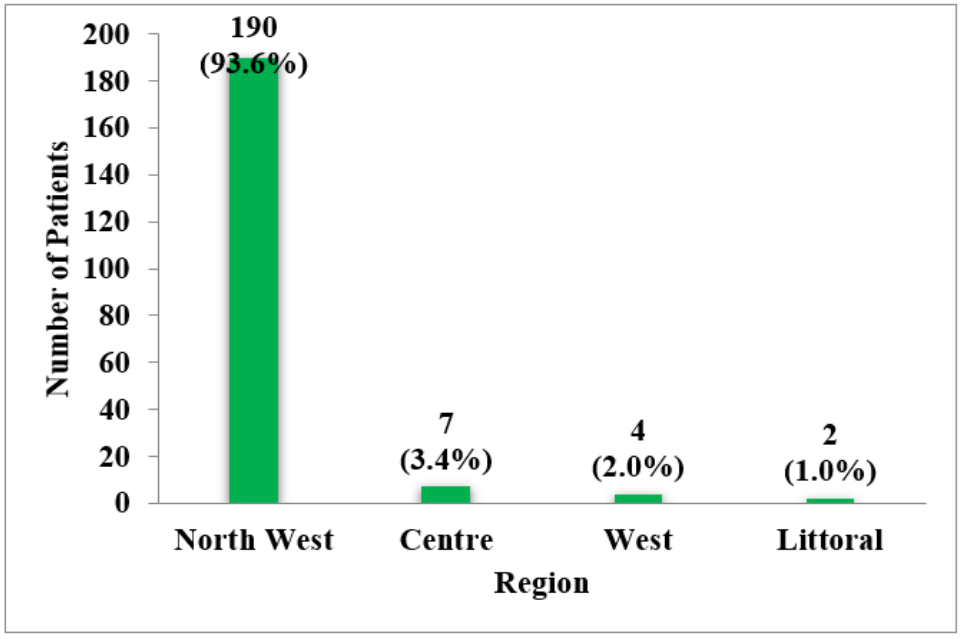


***Figure 3*:** *Distribution of patients by Region (n =203).*

Preoperative evaluation

Biometry was done for all patients. Intraocular pressure was measured in 97 eyes of which 35.7% was within normal this is shown in table 2 below

	n = eyes	
	Frequency	**Percent**
Eyes to be Operated On (n = 230)		
LE	129	56.5
RE	101	43.5
IOP (n = 230)		
Low(< 5 mmHg)	8	3.5
Normal (5 - 20 mmHg)	82	35.7
High (> 21 mmHg)	7	3.0
Not done	133	57.8
Biometry (n = 230)		
Yes	230	100

Table 2: *Preoperative evaluation.*

Presenting visual acuity was less than 3/60 in 82.2% of the eyes as shown in table 3 below.

Pre-Op Visual Acuity	n = 230 eyes	
	Frequency	Percent
Visual Impairment (< 6/18 - 6/60)	33	14.3
Severe Visual Impairment (< 6/60 - 3/60)	8	3.5
Blind (< 3/60)	189	82.2
Total	230	100

Table 3: *Pre-operative visual acuity (n = 230).*

A total of 23 (13.4%) patients were blind bilaterally and 149 (86.6%) unilaterally. The M: F = 1.3:1. This is shown in table 4 below.

Pre-op visual acuity		Laterality	
	Total (n)	Unilateral	Bilateral
Visual Impairment (< 6/18 - 6/60)	27	23 (85.2)	4 (14.8)
Severe Visual Impairment (< 6/60 - 3/60)	4	3 (75.0)	1 (25.0)
Blind (< 3/60)	172	149 (86.6)	23 (13.4)

Table 4: *Pre-operative visual acuity and laterality in patients (n = 203).*

Comorbidities

The frequency of ocular comorbidity was 34.9% with glaucoma seen in 40 (17.4%) of the eyes. Some ocular comorbidities were diagnosed preoperatively and some post operatively. This is shown in table 5 below. Only significant comorbidity was indicated on the patients file. There was no record of systemic comorbidities.

Comorbidities	Number of Eyes	Percent
None	150	65.2
Glaucoma	40	17.4
Retinal Diseases	16	7.0
Non-glaucomatous Optic Atrophy	10	4.3
Corneal Scar	7	3.0
AMD	4	1.7
Subluxated Lens	3	1.3
Total	230	100

Table 5: *Ocular comorbidities recorded (n = 230 eyes).*

Surgical techniques and intraoperative findings

The commonest surgical technique performed was MSICS (98.3%). ECCE with limbal incision was done for 4 (1.7%) of eyes. All the surgeries where done by ophthalmologist. IOL placement was not indicated for 8 (3.5%) eyes. The eyes with subluxated lens had ACIOL. This is shown in table 6 below.

	n = 230	
	Frequency	**Percent**
Type of Surgical Technique		
MSICS	226	98.3
ECCE	4	1.7
IOL		
Capsular Bag	214	93.0
Sulcus	4	1.7
AC IOL	4	1.7
Not Indicated	8	3.5
Incision		
Scleral Tunnel	226	98.3
Limbal	4	1.7

Table 6: *Surgical techniques.*

One hundred and eight eyes (47%) had correct IOL as per biometry readings. This is shown in the table 7 below.

Difference between IOL Power Inserted and Biometry Readings	Number of Eyes	Percent
2.50+	9	3.9
2.00	2	.9
1.50	4	1.7
1.00	8	3.5
0.50	53	23.0
0.00	108	47.0
-0.50	35	15.2
-1.00	5	2.2
-1.50	1	.4
-2.00	2	.9
-2.50	3	1.3

Table 7: *Comparison of biometry readings versus the power IOL inserted (n = 230).*

Complications

The frequency of intraoperative complication was 30 (13.0%) (Table 8) and postoperative complication was 90 (39.1%) (Table 9). Only the significant intraoperative complications was indicated in the patients file. The commonest intraoperative complication was PC tear with vitreous loss 10 (4.3%).

Intra-Op Complication	n = 230 eyes	
	Frequency	Percent
None	200	87
PC tear with vitreous Loss	10	4.3
PC Tear without vitreous loss	9	3.9
Hyphema	4	1.7
Zonular Dialysis	3	1.3
Iris Prolapsed	2	0.9
Others*	2	0.9
Total	230	100

Table 8: *Intra-operative complications (n = 230).*

**: Others includes Descemet stripping and Button hole (cornea).*

At day one post follow up visit forty eight eyes recorded complications with eight eyes having more than complication. At 2 - 3 weeks follow up visit twenty one yes had complications with four eyes having more than one complication. Fifteen eyes did not have record of day one post-operative complication. This is shown in table 9 below.

Post-Op Complications	N= complications									
	1st Post - op Day (N = 223)		2 - 3 wks. (N = 169)		4 - 6 wks. (N = 59)		7- 10 wks. (N = 61)		11+ wks. (N = 38)	
	N	%	N	%	N	%	N	%	N	%
Corneal complications[1]	50	22.5	11	6.5	0	0.0	1	1.6	0	0.0
Hyphema	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0
Endophthalmitis	0	0.0	0	0.0	0	0.0	0	0.0	1	2.6
PCO[2]	0	0.0	0	0.0	1	1.7	2	3.3	4	10.5
Uveitis	0	0.0	10	5.9	3	5.1	2	3.3	2	5.3
Decentered IOL[3]	2	0.9	2	1.2	2	3.4	1	1.6	2	5.3
Cortical Matter[4]	2	0.9	2	1.2	0	0.0	0	0.0	0	0.0
TASS	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0
None	167	74.9	143	84.6	53	89.8	55	90.2	29	76.3
Total	223	100	169	100	59	100	61	100	38	100

Table 9: *Post-operative complications.*

[1]: Corneal complication comprised corneal oedema, striate keratopathy, descemet folds, and bullous keratopathy.

[2]: PCO was seen as from sixth week.

[3]: One eye had washout of remnant cortical matter.

[4]: Redialing was done in one eye with decentered IOL.

Visual outcome

Good outcome was seen in 2.3% (5) eyes at day one, 4.2% (7) eyes at 2 - 3 weeks, 10.2% (6) eyes at 4 - 6 weeks, 9.8% (6) eyes at 7 - 10 weeks and 7.9% (3) eyes at 11 +weeks. 15 eyes did not have visual acuity recorded at day one follow up visit. This is shown in table 10 below.

Follow Up	N (eyes)	Good (6/6 - 6/18) N (%)	Borderline (< 6/18 - 6/60) N (%)	Poor (< 6/60) N (%)
Day 1	215	5 (2.3)	145 (67.4)	65 (30.3)
2 - 3 Weeks	165	7 (4.2)	117 (70.9)	41 (24.9)
4 - 6 Weeks	59	6 (10.2)	41 (69.5)	12 (20.4)
7 - 10 Weeks	61	6 (9.8)	46 (75.4)	9 (14.7)
11+ Weeks	38	3 (7.9)	27 (71.1)	8 (21.1)

Table 10: *Presenting visual acuity at follow up.*

At 4 - 6 weeks follow up visit of the 21 eyes left emmetropic (similar IOL power to biometry readings), 3 (50.0%) had good visual outcome, 17 (41.5%) moderate and 1 (8.3%) had poor visual outcome. This is shown in table 11 below.

Visual Outcome		IOL Power Versus Biometry				
	Total (n)	Over corrected by >+2.5 DS	Over corrected by +0.5 to +2D	Emmetropic	Under corrected by -0.5 to --2DS	Under corrected >-2.5 DS
Good	6	0 (0.0)	1 (16.7)	3 (50.0)	1 (16.7)	1 (16.7)
Moderate	41	1 (2.4)	12 (29.3)	17 (41.5)	10 (24.4)	1 (2.4)
Poor	12	0 (0.0)	9 (75.0)	1 (8.3)	2 (16.7)	0 (0.0)

Table 11: *Comparison of IOL Power versus biometry to visual outcome at week 4 - 6 weeks follow up visit (n = 59).*

At 4 - 6 weeks follow up visit for the patients that came for follow up the cause of poor outcomes is as shown in table 12 below.

Causes of poor surgical outcome VA < 6/60	Number of patients	Percentage
Comorbidity/Patient selection	7	58.3%
Surgical complications	1	8.3%
Refractive error	1	8.3%
Not indicated	3	25.0%
Total	12	100%

Table 12*: Causes of poor outcome (VA < 6/60) at 4 - 6 weeks follow up visit.*

Only 14 eyes where refracted. 40% (2) had good visual outcome at 4 - 6 weeks and 83.3% (5) had good visual outcome at 11+ weeks as shown in table 13 below.

Follow Up	Refracted eye (N= 14)	6/6 - 6/18 N (%)	< 6/18 - 6/60 N (%)
4 - 6 Weeks	5	2 (40.0)	3 (60.0)
7 - 10 Weeks	3	1 (33.3)	2 (66.7)
11+ Weeks	6	5 (83.3)	1 (16.7)

Table 13*: Post-op best corrected visual acuity at follow up.*

All the patients refracted where found to be myopic and 57.1% (8) had significant astigmatism this is shown in the table 14 and 15 below.

Absolute spherical error	N (Eyes)	Percentage
1 - 1.99	3	21.4
2 - 2.99	7	50
3 - 3.99	4	28.6
4+	-	-
Total	14	100
Cylinder		
0 - 0.99	3	21.4
1 - 1.99	8	57.1
2 - 2.99	1	7.1
3 - 3.99	1	7.1
4+	1	7.1
Total	14	100

Table 14: *Spherical equivalence and cylindrical power from refraction.*

Variables/ Factors	Total (n)	Poor Visual Outcome		OR (95% CI)	P Values
		Yes	No		
Laterality (n = 52 patients)					
Unilateral	41	7 (17.1%)	34 (82.9%)	0.360 (0.083 - 1.572)	0.164
Bilateral	11	4 (36.4%)	7 (63.6%)		
Age (n = 59 eyes)					
40 - 49	2	0 (0.0%)	2 (100.0%)	-	0.795
50 - 59	8	2 (25.0%)	6 (75.0%)		
60 - 69	24	4 (16.7%)	20 (83.3%)		
> 69	25	6 (24.0%)	19 (76.0%)		
Complications (n = 59 eyes)					
Yes	6	2 (33.3%)	4 (66.7%)	2.150 (0.344 - 13.424)	0.404
No	53	10 (18.9%)	43 (81.1%)		
Ocular comorbidities (n = 59 eyes)					
Yes	24	8 (33.3%)	16 (66.7%)	3.875 (1.011 - 14.848)	0.040
No	35	4 (11.4%)	31 (88.6%)		

Table 15: *Univariate analysis poor visual outcome at 4 - 6 weeks.*

Comorbidity was found to significantly affect visual outcome (p=0.04)

Follow up

There was a decline in follow up of from 215 (93.5%) seen day one follow up visit to 59 (25.7%) at 4 - 6 weeks follow up visit. This is shown in figure 4 below.

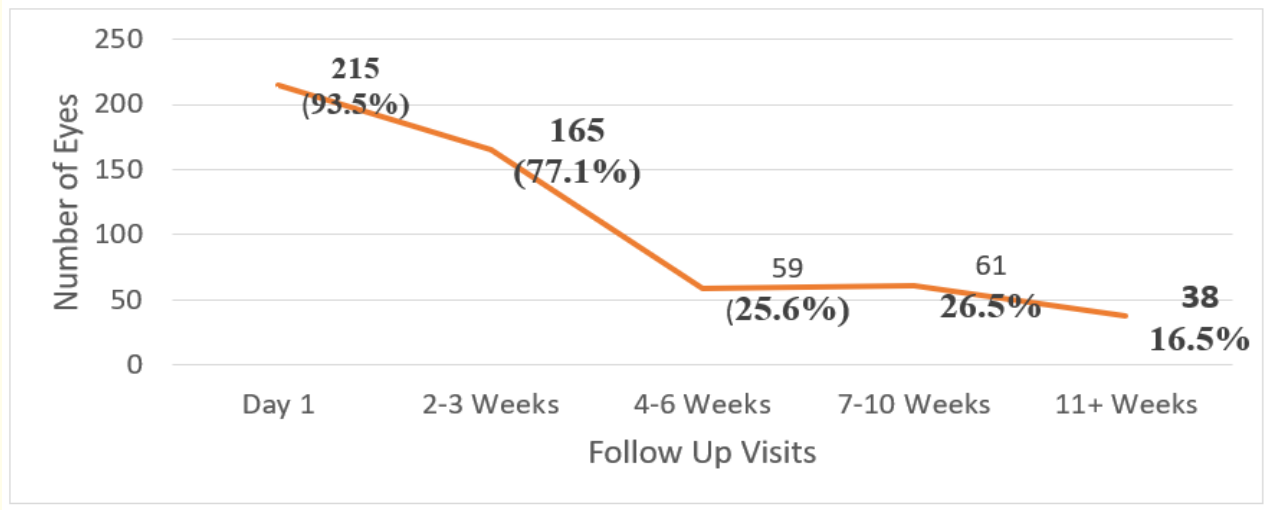


Figure 4: *Patient follow up.*

Discussion

Demographic characteristics

From the records reviewed the ages of patients ranged from 40 years to 87 years with 81.8% of patients over 60 years. The average age was 68.6 years with 57.6% of the patients being female. This is comparable to a study done in Kenya by Trivedy., *et al*. at the Lions Sight First Eye Hospital that found an average age of 67 years with 54.5% of patients being females. Njoya., *et al.* at the Litein Mission Hospital that found an average age of 64 years with 52% of patient being female [36,41]. Our study found a female predominance as opposed to male predominance (60.1%) observed by Isawumi., *et al.* in western Nigeria. However it's been found that there's gender inequality in the uptake of cataract services where women are disadvantaged [42]. Furthermore, literature review and meta-analysis of cataract surveys in developing countries found that the cataract surgical coverage rate was 1.2 - 1.7 times higher for males than for females [43]. The female predominance in our study could be explained by the fact that most women engage in income generating activities and as such financially capable to go to hospital should need arise coupled with incentives from women support groups that exist in the area.

Preoperative evaluation

A thorough preoperative evaluation is necessary to establish expected surgical problems, expected benefits and comorbid conditions having an influence on cataract surgery. This is advocated in the Royal College of Ophthalmology guidelines on cataract surgery. In our study all the eyes had vision taken at presentation and biometry done. Intraocular pressure measurement was not routinely done and systemic comorbidity were not captured on patient files.

Presenting Visual acuity

In this study 189(82.2%) of the eyes were blind and 8(3.5%) had severe visual impairment. This is comparable to the findings by Ilechie*., et al.* in Ghana that showed 99.7% of the operated eyes were blind and to the study by Isawumi., *et al*. in western Nigeria that showed 96.1% of patients had presenting visual acuity of less than 6/60. Yorston*., et al. at* the Kikuyu eye unit in Kenya, found 93.8% of the eyes had presenting visual acuity of less 6/60 [38]. Looking at the studies done in the developing world which more or less make up the low income countries it appears late presentation is a common feature. This is in contrast to the high income level countries, such as the United Kingdom where no patient presented with a vision poorer than 6/18 [44]. Furthermore, a review done in 13 European countries in the European cataract outcome study, showed 31.5% of eyes had presenting visual acuity of less 6/60 which was less than what we found in our study [50]. A possible reason for late presentation in our study could have been due to difficulty in accessing the hospital from the surrounding districts. In addition farming is the major preoccupation in the region which most times does not need pristine vision making them report late.

Visual Outcome

This study found on the first post-operative day good outcome in 2.3% of eyes and poor outcome in 30.3% of eyes. This fell short of WHO recommended guidelines for outcome of cataract surgery. This could have been due in part to the corneal complications documented on the first operative day at 23.3%. Our study was comparable to that by Ilechie., *et al.* that recorded a 29.2% poor outcome within 48 hours though the good outcome at 22% was more than what we found on day one follow up visit [34]. The good outcomes in our study were considerably low compared to observations made by Obiudu., *et al.* in South East Nigeria were 29.6% of the eyes had good outcome and 19.5% poor outcome at the time of discharge which was lower than what we found [39]. Bitok., *et al.* in Kenya had day one poor outcome of 23.3% which is comparable to what we found in our study and this was attributable to the corneal complications recorded in both studies. In their study however they recorded a day one good outcome of 40.8% as opposed to 2.3% recorded in our study [44].

At the week 4 - 6 weeks follow up visit, out of the 59 patients who came for review 6 (10.2%) had good outcome, 41 (69.5%) borderline and 12 (20.4%) poor outcome. Again, this values fall below WHO benchmark of greater than 85% good outcome, less than 15% borderline, less than 10% poor outcome for uncorrected visual acuity following cataract surgery. The outcomes in our study differ from findings by Oye*., et al.* in the south west region of Cameroon were 64.3% of eyes had poor outcome and 25% good outcome, their study was however a community based as opposed to our study which was hospital based [6]. In a study done in Nigeria by Mpyet., *et al*. at 6-weeks follow up visit 69.0% had good outcome and 5.6% poor outcome much better compared to the findings in our study though in their study they excluded all those with preexisting ocular comorbidity which was not the case in our study [40]. Furthermore, Ilechie., *et al.* in a study done in Ghana on the evaluation of post-operative visual outcome at 4 - 6 weeks follow up visit 41.2% had good outcome and 9.5% had poor outcome which again was better that what we found [34]. A similar study done *Yuan., et al.* in China showed good outcome in 61.0% of eyes and 12.2% poor outcome which is in contrast to what we found in our study [51]. The good outcomes in the above studies even though better than what we found still fell below the > 85% bench mark for uncorrected visual acuity following cataract surgery. In contrast a UK study showed 85% good outcome achieving greater than 6/12 vision [44]. For the eyes that where refracted at 4 - 6 weeks 2 (40.0%) had good outcome, 3 (60.0%) borderline and none had poor outcome. At 11 weeks plus 5 (83.3%) had good outcome, 1 (16.7%) had borderline and none had poor outcome. This was almost in keeping with the WHO recommendations, for BCVA of 90% for good outcome and < 5% for poor outcome. Our study could in part be compared to observations by Yorston*., et al.* at the Kikuyu eye unit, Kenya where 82.9% eyes had good outcome 8 weeks after refraction. In their study as much as 81.6% (330) eyes out of 404 eyes had refraction done as opposed to just 14 eye out of 230 eyes in our study [38]. Similarly *Hennig., et al.* in Nepal, found good outcome in 96.2% of eyes at 6 weeks and *Yuan., et al.* in china had good outcomes of 69.5% eyes at 6 - 8 weeks following refraction. This shows that postoperative refraction was indeed an important factor in obtaining good visual outcome.

IOL Power

This study found that all the eyes received intraocular lenses (93.0% PC-IOL and 1.7% AC-IOL, not indicated in 1.7%). A total of 108 (47.0%) of the eyes were left emmetropic as per biometry readings. The other eyes were either under-corrected or over-corrected compared to their biometry readings, due to lack of the exact IOL power as per the biometry, leading to the use of the next available IOL power. This was in part due to non-availability of IOL as most of stock came as donations so they had to use what was available which could have adversely affect visual outcome. For the eyes left emmetropic as per the biometry readings in the 4 - 6 weeks follow up visit only 50% (3) had good outcome, 41.5% (17) moderate and 8.3% (1) poor outcomes. Out of the 12 patients that recorded poor outcome 75% (9) were over corrected as per biometry and 16.3% (2) where under corrected (Table 11). This could have been attributed to the inaccuracies noted during biometry measurement as biometry was done by ophthalmic attendants with in-service Furthermore given that only 14 eyes had refraction done it becomes difficult to significantly correlate the absolute spherical error with findings at biometry.

Intra-operative complications

In this study, a total of 30 (13.0%) eyes had intra-operative complications. Only the most significant complication was indicated in patients files. Bitok., *et al.* in Kenya had a similar observation. The commonest intraoperative complication was posterior capsule tear with vitreous loss (4.3%). The intraoperative complication rate was outside the recommended WHO standard by being greater than 10% though the vitreous loss rate was not more than 5% as per WHO standards. Our study recorded less intraoperative complication compared to a study by Isawumi., *et al.* in western Nigeria were 27.35% of eyes had vitreous loss and 6.28% posterior capsule tear. A study done in India by Ajith., *et al.* found intraoperative complications to be 11.5% with PC tear accounting for 2.5% which was similar to what we found [46]. In the same vain the complications recorded in our study was more than that observed by Trivedy., *et al.* in Kenya, where 1.6% of eyes had intraoperative complication of which 0.5% had PC tear with vitreous loss and 0.3% with PC tear alone. Lastly, our study recorded a higher intraoperative complication rate compared to the 1 - 2% normally observed in high income countries [31,35].

Early post-operative complications

At day one post operatively the complication rate was 25%. Corneal complications were the commonest constituting 23.3%. At the week 2 - 3 follow up visit, the complication rate was 14.2%, the commonest was uveitis (5.9%). This study recorded more complications compared to observations made by Ilechie., *et al.* in a study done in Ghana which found early surgical complications in 10.1% of the eyes, with the most common being cornea oedema (3.4%), and hyphema (2.2%) [34], Trivedy., *et al.* in a study done in Kenya recorded a day one post-operative complication rate of 12.6% with most being corneal oedema plus descemet folds (6.6%) and cornea oedema (4.8%) [36]. In this study corneal complications were the commonest, this is comparable to that found by Bitok., *et al.* in Kenya where corneal complications made up 70.94% on day one follow up visit as opposed to 22.5% in our study. However, in their study the day one post-operative complication rate was 5% as opposed to 25% found in our study.

Late post-operative complications

At the 4 - 6 week follow up visit, 6 eyes (10.2%) had complications with uveitis accounting 5.1% (3). At 7 - 10 week follow up visit 6 eyes (9.8%) had complications of which uveitis and PCO accounted for 3.3% (3) each. At 11 weeks plus 9 eyes (23.9%) had complications with PCO constituting 10.5% (4) followed by uveitis 5.3% (2). Similar observations were made by Ilechie., *et al.* in Ghana, where late surgical complications occurred in 2.8% of the eyes; as well as Obiudu., *et al.* in Nigeria where late complication occurred in 5% of eyes [34,39]. This study did not show any statistical relationship between late complication and poor outcome at 4 - 6 weeks post operatively.

Comorbidity/patient selection

In this study, 34.7% patients had comorbidities, some of which were diagnosed pre-operatively and others post-operatively. Glaucoma was the commonest comorbidity at 17.4%. Comorbidity has been found to adversely affect visual outcome as seen in the study by Sonron., *et al.* in Trinidad where 32% of eyes had ocular comorbidities with the bulk constituted by glaucoma and ARMD. This was comparable to

what we found in our study. Isawumi., *et al.* in Nigeria found a lower frequency of co-morbidity at 17.3% compared to our study with glaucoma accounting for 11.7% [35]. Nganga., *et al.* in Kenya found 15.3% of the eyes to have ocular comorbidity with glaucoma making up 6.76%. Despite comorbidities being recorded surgery was still carried out with the intent of achieving navigational vision in a previously blind patient. Overall excluding the Comorbidity visual outcome remain poor in 36% of eyes and good outcome in 3% with a majority of eyes (74%) having moderate outcomes. Our study showed a statistical significant relationship between comorbidity and poor visual outcome (p value- 0.040).

Causes of poor outcome

Overall, causes of poor outcome included comorbidity/patient selection in 34.7% of patients, surgical complications in 20.4% of patients, late surgical complications in 13.3% of patients and refractive error in 6.0% of patients. Comorbidity as a cause of poor outcome was found to be higher in our study as oppose to the finding by Malik., *et al.* in Pakistan that showed 7% as cause of poor outcome. In terms of comorbidity our study showed similar findings with that done by Lindfield., *et al.* in Kenya and Pakistan where comorbidity accounted for 26% and 27% of adverse outcome respectively. However, in their study refractive error accounted for 37% and 49% of adverse outcome respectively. The same cannot be said for our study as only 6% of patients were refracted. At 4 - 6 weeks post-operative follow up visit poor outcomes were seen in 12 eyes with comorbidity accounting for 58.3% (7), surgical complication/sequelae 8.3% (1), refractive error 8.3% (1), cause was not indicated in 25% (3).

Follow up

In this study of the 230 eyes operated, 93.5% were seen on day one after which there was a drop to 71.7% at 2 to 3 weeks follow up visit, 25.6% at 4 - 6 weeks, 26.5% at 7 - 10 weeks and only 16.5% at above 11 weeks. A presumed reason could be that the level of post-operative vision was adequate for their main occupation which predominantly is farming. Despite the low cost of services in the hospital access from the surrounding district is costly and this could in part be responsible for low turn up. Also patients might have been dissatisfied with the outcome and elected to go to another facility as was observed by Ilechie., *et al.* in Ghana [34]. The high percentage of those lost to follow up at this early postoperative time is not uncommon in the developing countries. Our study had a far lower follow up rate compared to the findings Yorston., *et al.* that showed 87.6% and 75.1% at 4 weeks and 8 weeks respectively [38]. However, in their study the patients were contacted by writing to them in their last known address which was not the case in our study.

Conclusions

1. The post-operative BCVA at 4 - 6 weeks post-operative was found to be below the WHO guidelines.
2. Ocular comorbidity was major cause of poor outcome.
3. Refraction was scarcely done for patients post operatively.
4. Low follow up rate may have adversely affected outcomes.

Recommendations

1. Device a patient information capture form and institute a cataract audit system via electronic data base. This will improve documentation and keep track of patients for future reference.
2. Device a means of reaching out to the patients to ensure there come for follow up visits either by use of SMS to remind patients when follow update is due or community health workers to reach out to them in case there fail to turn up.
3. Provide wide variety of IOL powers and improve biometry and IOL power calculation through capacity building.
4. Refraction for all patients should be made as a rule.

Study Limitations

1. Surgical outcomes of the patients who were lost to follow up were not captured.
2. This was a retrospective study and there dependent on availability and accuracy of patient records

Conflict of Interest

There was no conflict of interest exists.

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