REVIEW OF CHILDHOOD CATARACT SURGERY AT KIKUYU EYE UNIT.

A dissertation submitted in part fulfillment for the degree of master of medicine (ophthalmology), Faculty of medicine, department of ophthalmology University of Nairobi.

By

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June 2007.

DECLARATION

This dissertation is my original work and has not been presented for a degree in any other university.

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DEDICATION

To Children; their eyes are splendid.

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Abbreviations

AV	:	Anterior Vitrectomy
CF	:	Counting fingers
CMV	:	Cytomegalovirus
CNS	:	Central Nervous System
ECCE	:	Extra-capsular Cataract Extraction
FL	:	Following Light
GA	:	General Anaesthesia
HM	:	Hand movement
IOL	:	Intra-ocular Lens
IOP	:	Intra-ocular pressure
KEU	:	Kikuyu Eye Unit
LE	:	Left Eye
LWO	:	Lens washout
Nd: YAG	:	Neodymium: Yttrium-Alumium- Garnet
NPL	:	No perception of light
OR	:	Objective Refraction
PCO	:	Posterior Capsule Opacification
PL	:	Perception of light
PPC	:	Primary posterior capsulotomy
PHPV	:	Persistent Hyperplastic Primary Vitreous
PO	:	Picking Objects
PO op	:	Post operative
Pr op	:	Pre operative
RE	:	Right Eye
VA	:	Visual acuity

Abstract

Objective: To establish the long term outcome of cataract surgery in children below 15 years performed between 1996 and 2005 at Kikuyu Eye Unit.

Methods: This was a retrospective study. We reviewed records of children who under went cataract surgery from January 1996 to December 2005 at KEU.

Results: Nine hundred and fifty three (953) files of patients with childhood cataract (1,514 eyes) were reviewed. 39.3% were female and 60.7% were male. The age range was 2 months to 15 years and the mean 7.4 years. 58.9% had bilateral cataracts while 41.1% were unilateral. The commonest type of cataract operated was congenital cataract. 18.0% of the operated cataracts had past eye disease. 90.7% of those who had past eye disease were due to trauma. 5.9% had other systemic findings of which 21.4% of these were due to congenital rubella syndrome. Pre-operative vision ranged from 6/12 to NPL. 25.2% did not have their vision indicated. 5.6% of the eyes had anterior segment findings and these were due to past trauma. 25% of the eyes had posterior segment findings. The commonest surgical technique used was lensectomy + AV + IOL which accounted for 61.2%. Aphakia was mainly corrected with IOL + spectacles (71.7%). Complications were noted in 788 eyes (52%) operated and included Fibrinoid reaction in 466 eyes (59.2%), PCO in 120 eyes (15.4%) and amblyopia in 36 eyes (4.6%). Other complications were extremely rare. Follow-up was very poor. However, from the few that came for follow-up refractive change (myopic shift) with time was noted in both congenital and traumatic cataract. In both congenital and traumatic cataract vision improved with time. Visual acuity improvement at 6 months was seen to be better in traumatic cataracts than in congenital cataract. Eyes with pre-existing strabismus also showed improvement in visual acuity as well as those with pre-existing nystagmus.

The least improvement was seen in eyes with pre-existing microphthalmos.

Conclusions: Though it was not possible to accurately determine long term outcome of childhood cataract surgery because of poor follow-up the following observations were made;

- visual outcome improved with time post-operative in both congenital and traumatic cataract
- there was myopic shift observed with time in both congenital and traumatic cataract at six months.
- Children with pre existing nystagmus and strabismus had better visual outcome compared to those with pre existing microphthalmos at six months.

Recommendations: In view of the above conclusions the following is recommended;

1. Address barriers to follow-up of children after cataract surgery
2. All children coming with associated ocular finding such as nystagmus and strabismus should be operated on.
3. Whenever you implant an IOL in a child bear in mind that myopic shift will occur.

1.0 INTRODUCTION

1.1 BACKGROUND

Cataract remains one of the most important avoidable causes of blindness in children. It has been estimated that there are 200,000 children blind from cataract worldwide, and that 20,000-40,000 children are born with cataract every year. In developing countries the prevalence of blindness from cataract is thought to be about 1-4/10,000 children. This is about 10 times higher than the figure for industrialized countries. The lower prevalence of blindness in developed countries is probably as a result of better management of cataract [1].

In East Africa cataract is now the leading cause of blindness in children. A published study from Uganda estimated that cataract was responsible for over 30% of all cases of blindness and visual impairment in children. Furthermore, the results of surgery for cataract in Uganda were poor. Of those children for whom follow up data was available, 56% had a corrected vision of less than 6/60 [2].

One reason for the poor outcome of cataract surgery in Africa is attributed to; difficulties in obtaining full correction of refractive errors in young children, Contact lenses being expensive for most African families, Glasses getting lost or broken, and difficulties to fit on infants and young children[3].

Following campaigns and sensitization on the use of hydrogel intraocular lenses in children [3], Kikuyu Eye Unit started to use lens implants for paediatric cataracts as a routine since 1993.

This study reports the of cataract surgery with intraocular lens insertion in children at Kikuyu Eye Unit over a ten year period.

2.0 LITERATURE REVIEW

2.1 Epidemiology

Various reports worldwide have shown varying data on prevalence of childhood cataract blindness [6].

A combined community and school for the blind Study done in East Africa by Waddell et al found that cataract was the leading cause of blindness in children which was estimated to be 30% of all cases of blindness and visual impairment in Ugandan children[2].

Similarly Chirambo et al found 27% of children in Malawi to be blind due to cataracts [4].

In Jamaica, 39% of the blind children were due to cataract. Of more concern was that the visual outcome was poor even after cataract surgery [5].

2.2 Management of Childhood Cataract

2.2.1 Overview

The management of cataract in childhood just as in adults depends on surgical removal of lens matter in order to clear the visual axis. However, management in children is complicated by the fact that paediatric cataract surgery is technically more difficult and requires frequent post-operative follow up. It is unwise to equate a childhood cataract to a smaller replica of an adult cataract.

Questions related to the management of childhood cataracts include; the timing of surgery, type of surgery, personnel doing the surgery, and place where the surgery will be done. Good visual outcome depends on doing surgery as early as possible within the period of onset of visually disabling cataract [6].

2.2.2 Timing of surgery

In deciding when to operate, the surgeon is usually caught in a catch-22 situation. If he operates early, there is more inflammation, difficulty in accurate IOL power calculation and increased risk of GA, and if he delays surgery there are greater chances of dense amblyopia developing resulting in poor vision. [7].

The concept of a visually sensitive period has been well developed. It is known from animal studies that reduced visual input from birth to 3 months leads to reduced connections between the cortical cells and the affected eye and a reduced number of binocularly driven cells. These changes can be reversed if there is early restoration of visual clarity [8]. For humans, variations in visual outcomes are still seen despite significant improvement in treatment over the past 30 years. Patients with monocular cataracts have two predisposing factors for the development of amblyopia, binocular rivalry and visual deprivation [8].

To prevent otherwise irreversible amblyopia, patients with dense cataracts should have surgery and optical rehabilitation before the age of 17weeks [7].
Superior visual acuity correlates with earlier surgery and rigorous amblyopia therapy [9]. Some authors believe that surgery should be done by the age of 8 weeks for a favorable outcome [10, 11, 12]. However, there are contradicting data concerning surgery within the first four weeks of life, with regard to a higher incidence of complications [13, 14].

In summary, the common and generally accepted practice is to perform, for congenital visually significant cataract as early as possible to prevent irreversible Amblyopia [7].
Seven infants with complete bilateral cataracts were operated on and fitted with extended-wear silicone contact lenses. The infants were matched to 16 normal control subjects. A modified preferential looking technique was used to assess

visual acuity; the Bayley Scale of infant Development was administered to measure psychological development. Of the seven infants with cataracts, those operated on prior to 8 weeks of age seemed to have normally developing vision. All others showed a substantial visual lag when compared with the control group. Bayley scores for infants operated on early (before 8 weeks) fell within the range of normal variability. The infants operated on later showed a statistically significant lag in development. Also, a pendular nystagmus was noted in those infants with cataracts who were operated on later [10].

Anna and Ulla have also reported their findings. They studied records of 30 consecutive children operated on before the age of 12 months at St. Erik's Eye Hospital over a 5-year period between 1991 and 1996.The patients were followed until 4-9.5 years of age. Linear Snellen Visual Acuity (VA), occlusion therapy compliance, and the presence of nystagmus, strabismus and other complications were reported.

Six children achieved VA of 0.1 or better. They were all operated on before 3 months of age. Of the 12 infants operated on before 6 weeks of age, four had VA between 0.3 and 0.4 and eight had VA of finger counting or less. Four developed severe secondary glaucoma within 6 months of cataract extraction. Two of these had persistent fetal vasculature. Three eyes developed glaucoma and became amaurotic.

Occlusion therapy was abandoned before the age of 2.5 years in 21 children. They concluded that Good levels of VA were achieved only in children who underwent cataract surgery before 3 months of age and who adhered to the occlusion therapy schedule. Severe secondary glaucoma developed in four out of 12 children operated on within 6 weeks [12].

Magnusson et al investigated the long term effects of age at surgery on the development of visual acuity by measuring VA from pre-school age to puberty. All children born in four western counties of Sweden between January 1980 and December 1993 who were diagnosed with congenital cataracts were included in a longitudinal prospective study. The monocular VA of the better eye in 38 subjects was analyzed at 4, 7, 10, and 12 years of age, with 20 total and 18 partial cataracts. The mean follow up time was 9.3 years after surgery. The final value of VA was 0.4 or above for approximately 50% of the subjects at 12 years of age. Visual acuity improved to a considerable extent after school age, especially in children who underwent surgery between the ages of 7 weeks and 1 year. Results for partial cataracts were favorable compared to those for total cataracts, reaching a mean of approximately 0.5 at age 12.

The mean VA in the group of total congenital cataracts operated on before 7 weeks of age achieved higher values of VA at 4 years of age compared to children with total cataracts operated on between 7 weeks and 1 year of age. However, no statistically significant difference in VA results among these groups could be proved. They concluded that visual acuity improves to a considerable extent after school age in children with delayed visual development caused by congenital cataracts.

Surgery within 7 weeks results in a more rapid development of VA, initially [15]. While timing of surgery needs balance between the effect on visual development and risk of surgery. Type, density and laterality of the cataract are other important factors to consider [7].

2.2.3 Pre-operative Assessment

This stage involves full ocular or ophthalmic examination which in itself can be difficult in the sense that it is not often easy to get good cooperation from the children. As a result to get a full examination of the eyes children have to be subjected to examination under anaesthesia. This means that few children in whom the surgeon is unable to perform surgery on initial exposure to GA will have to be subjected to GA and its risks the second time [6]. Sometimes some of these children may have other congenital anomalies of the cardiac system or the central nervous system which will make subjecting these children to GA difficult. This necessitates a multidisciplinary approach [9]. There may be other pre-existing ocular anomalies such as congenital glaucoma, PHPV and miccrophthalmos. These conditions may make clinical evaluation of the children very difficult and at times may also be indicative of poor surgical prognosis [7].

2.2.4 Surgical Techniques

Increased intra-operative difficulties such as low scleral rigidity, increased elasticity of the anterior capsule, high vitreous pressure, microphthalmia and pupillary miosis contribute to the difficult in achieving a good visual outcome in paediatric cataract surgery. Besides, bag loss or tear can be encountered during surgery. Adaptation of techniques for cataract surgery specific to children is necessary for optimal visual outcome. Several authors have published guidelines regarding adult and paediatric cataract management in the industrialized world. In developing countries there are no publications that provide guidelines regarding the management of paediatric cataract [7, 15, and 21].

Based on published studies and their working experiences Wilson et al, Yorston et al and Sandford-Smith agree that even if there is no clear guideline about the cataract surgery for developing countries, it is generally agreed that extra-capsular cataract surgery with primary posterior capsulotomy and anterior vitrectomy (ECCE, PPC and AV) provide the best option for a long term clear visual axis [16, 18, 32] When long term follow up is not likely and Nd: YAG laser treatment is not available, the recommended method is ECCE, PPC and AV with IOL implantation for all children 8 years of age and younger. For children above 8 years old until the end of growth, PPC is still recommended although AV at this age becomes optional [7]. Primary IOL implantation is another area which is still under a lot of debate. Some authors argue that IOLs should only be implanted primarily in children who are 2 years and above [15]. However, Wilson et al has reported good long term outcome in children younger than 2 years who had primary IOL implantation. The only important requirement was a minimum corneal diameter of 10mm.

William and Yorston separately recommended that IOL implantation is the treatment of choice for most children in the developing world and is best done at the time of surgery [17, 19].

The results of using the various surgical techniques mentioned above have been reported in some of the studies concerning peadiatric cataract. These include the study by Basti et al in which he looked at 192 eyes with an age range of 2-8 years, mean follow up 11.3 months. 23 eyes had lensectomy and anterior vitrectomy with an outcome of 0% posterior capsule opacity. 87 eyes had ECCE + IOL only and 43.7% developed posterior capsule opacity. The remaining 82 eyes had ECCE + PPC + AV +IOL only 3.6% had PCO.

The other study was by Yorston et al in which he looked at 118 eyes (71 patients) with age range of ≤11years (mean age of 3.5 years) with a mean follow up of 3months. 56 eyes had anterior capsulotomy and lens aspiration only and of these 35.7% developed posterior capsule opacity. The other 62 eyes had primary posterior capsulectomy plus anterior vitrectomy. Of these only 1.6% developed posterior capsule opacity [19].

Eckstein et al studied 112 eyes (56 patients) with an age range of 3 months to 10 years (mean age of 53 months) with a mean follow up of 3 years. 56 of the eyes had lens aspiration with primary posterior capsulotomy only 66.1% of these developed posterior capsule opacity. 56 had lensectomy and vitrectomy and only 1.8% of these had post capsule opacity.
Because of the above results of PCO it is now recommended that PCC be performed on children less or equal to 8 years at the time of surgery [7].

Anterior vitreous face is more reactive in infants and young children and hence should be removed. Inflammatory response in small children is severe and fibrous membrane may form on an intact vitreous face [7]. This acts as a scaffold not only for equatorial cell migration and proliferation but also for metaplastic epithelilial cells and the cells that result from break down of the blood aqueous barrier.
It is therefore recommended that primary anterior vitrectomy be done only in children lens than 2 years at the time of surgery [6].

Intraocular lens optic capture while helpful in implant cent ration does not assure a permanent clear visual axis in children less than 6-8 years of age [7].

Supratic et al reported in there prospective study including 45 eyes of 27 children with congenital cataract aged from 3 weeks to 23.5 months that there is no significant difference in PCO between IOL optic capture and capsular bag implantation when PPC and AV was done. They also noted increased posterior synechiae and pigment deposition on IOL in the optic capture group [22].

2.2.5 IOL Type and Power

The appeal of using the IOL for aphakic correction stems from its ability to provide continuous, optically optimal refractive correction immediately following surgery, without dependence on compliance by the patient and family. Although IOLs were first tried in children in the late 1950s, pediatric usage has lagged far behind implantation in adults.

This fact is in part a reflection of the basic conservatism of most pediatric cataract surgeons, who wished to see ample confirmation of the safety and efficacy of IOLs in adults before subjecting children to their widespread application. It also reflects skepticism engendered by the frequency of complications and poor outcomes seen after early IOL use in children. Ophthalmologists now recognize, however, that many of the early problems with pediatric lens implantation were attributable to employment of procedures and lens designs that are no longer considered applicable. Early experiences served as crucibles for the conception of newer and much improved techniques [18].Recent reports in the literature indicate very encouraging short- to intermediate-term results following childhood cataract surgery with IOL use.

Sima et al evaluated the safety and outcome of foldable silicone intraocular lens (IOL) implantation in children in the department of ophthalmology, university of Giessen, Giessen, Germany. They looked at the results of cataract extraction and silicone IOL implantation in children having surgery between 1992 and 1997 and retrospectively analysed 8 eyes (7 patients). All IOLs were implanted in the capsular bag through a 3.5 mm clear corneal incision in 4 eyes, primary posterior capsulectomy and anterior vitrectomy were performed. The mean patient age at the time of surgery was 5.1 years (range 8 months to 15 years). The surgeries were uneventful. All IOLs remained anatomically stable and well centered during the mean follow up of 29.6 months (range 18 to 46 months) postoperative inflammatory reaction was minimal. Neither fibrinoid exudation nor posterior synechias occurred postoperatively. Postoperative best spectacle-corrected Visual acuity ranged from 20/800 to 20/20.

All eyes with an intact posterior capsule developed posterior capsule opacification. In the 4 eyes that had primary posterior capsulectomy and anterior vitrectomy, the visual axis remained clear. They concluded that these preliminary results suggest that silicone IOL implantation in children is a safe procedure with good and stable short-term anatomic results. Longer follow-up is necessary to answer questions about the long-term safety of silicone lens implantation in a child's eye [23].

Another study to assess the short-term outcomes of single-piece acrylic intraocular lens (IOL) implantation in children was done at Miles center for pediatric ophthalmology, storm eye institute, medical university South Carolina, Charleston, USA. They did a retrospective case review comprising 43 consecutive implantations (33 patients) of a single-piece hydrophobic acrylic IOL (AcrySof SA30AL or SA60AT, Alcon). An analysis of 42 eyes with posterior capsulectomy and vitrectomy was performed. Eyes with traumatic cataract and secondary IOLs were excluded. The mean age was 33.5months +/- 28.9 (SD) (range 0.5 to 110 months) and the mean follow-up, 12.0 +/- 8.2 months (range 1.0 to 27.5 months). Postoperative opacification of the visual axis occurred in 7 eyes (16.7%). Secondary surgical procedures were observed in 8 eyes (19.0%) and synechias, in 5 eyes (11.9%). All IOLs were well centred postoperatively. They too concluded that short-term data suggest that implantation of the AcrySof single-piece hydrophobic acrylic IOL is safe in the pediatric eye [24].

Still, the relative novelty of this technique, and the very long life expectancy of children who will be subjected to it, warrants a continuing degree of caution in its application. It will probably take several decades before we definitively know the role of IOL implants for the correction of pediatric aphakia [7].

Selection of lens power has been one of the most controversial topics relating to pediatric IOL implantation. It is well known that the power required for aphakic correction declines precipitously during the first year of life, and to a considerable further degree during the ensuing childhood years [19]. Thus, a pseudophakic eye that is emmetropic at age 1 year may become 5-10 diopters myopic by maturity. There is, however, a lack of long-term follow-up data on which to base predictions of the ultimate refraction of an eye that receives an IOL early in childhood .(The change that will occur may be different for pseudophakic than for aphakic eyes, given the dynamic control of ocular growth under the influence of visual experience. Furthermore, if an eye is rendered significantly ametropic at an early age, supplemental refractive correction in spectacle or contact lens form becomes essential to ensure optimal visual development, neutralizing much of the advantage of using an IOL [7].

Gouws et al documented the long term outcome of congenital cataract surgery with primary posterior chamber (PC) lens implantation in the first year of life. They did a retrospective review of congenital cataract surgery in the first year of life with PC lens implantation in 18 infants, eight with unilateral and 10 with bilateral cataract. The average age at surgery was 15 weeks (range 3–44 weeks). The mean follow up was 95 months (range 60–139 months). The best outcomes were in the bilateral group where 50% of eyes achieved 6/18 or better, with a best acuity of 6/9. Acuities were poor in the unilateral group where only 38% achieved 6/60 or better, with a best acuity of 6/24. There was a mean refractive shift between first refraction after surgery and refraction at 36 months after surgery of –3.44 dioptres with a very wide range (+2.00 to –15.50). There was a significantly greater myopic shift in the unilateral cases.

Many eyes in both groups continued to show an increasing myopic shift between 36 months after surgery and their final recorded refraction [10].

A study was done in Japan to evaluate the intraocular power calculation formula for children and the change of the refraction. They reviewed the medical records of 66 pediatric cases with intraocular lens (IOL) implantation after cataract extraction and results of questionnaire of the Japanese Association of Pediatric Ophthalmology and Japanese Society of Cataract and Refractive Surgery. They employed four IOL power calculation formulae (SRK, SRK II, SRK/T, Holladay) to evaluate the accuracy of preoperative prediction of refraction. The best preoperative prediction was obtained by the SRK formula; the predictive refraction error within +/- 1 D was shown in 65% of patients. SRK/T and Holladay formulas were less accurate in patients aged 5 years old or younger. All formulae were less accurate in patients with axial length of 22 mm or shorter. There was no significant difference in the mean change in refraction over four years among three different age group (group 1: < = 5, group 2: 6 << = 10, group 3: 11 << = 15(years old0). However, several patients aged 10(years old) or younger showed severe myopic changes. They concluded that IOL power calculation fomulae show less accuracy on pediatric cases and that It is also difficult to predict the change of refraction on pediatric cases [20]. In order to minimize the need to exchange IOLs later in life when a large myopic shift occurs, it is advisable to undercorrect children with IOLs during surgery so that they can grow into emmetropia or myopia in adult life [25].

2.2.6 Post-operative Complications

Follow up of children after cataract surgery forms a crucial element in the management of childhood cataract surgery. It is often very long term follow up and it encompasses looking out for surgical complications and continuous refraction in order for the children to have optimal visual acuity at all times. Cataract surgery in children carries a higher incidence of complications than in adults. Every child who does not have a posterior capsulotomy will develop posterior capsule opacification. This can be treated by making an opening in the capsule with Nd: YAG laser or a needle. Alternatively the posterior capsule and anterior vitreous can be removed with a vitrector. If the capsule is opened without removing the vitreous, the opacification may recur on the anterior hyaloid face [6,7].

Eckstein et al in their study in India found that 18% of the children had PCOs following cataract surgery and it occurred after three months of surgery whether PPC was done or not [17]. It was not reported whether patients who had PPC also had AV.

Glaucoma may occur after lensectomy particularly if it is carried out in the first week of life. This glaucoma is very difficult to treat and frequently leads to blindness. It was less in aspiration with PPC and more where aspiration alone was done. In his study it was reported that delaying surgery until the child is 3-4 months old makes it unlikely that the eyes will recover 6/6 vision due to amblyopia, but reduces the risk of glaucoma significantly[20].

Retinal detachment is more common in eyes that have had surgery for congenital cataract. It often occurs very late on average 35 years after the operation. If any patient complains of sudden loss of vision, even if it is years after the operation for congenital cataract, it should be assumed to be due to retinal detachment until proven otherwise [14].

Amblyopia is another common complication in paediatric cataract surgery. Yorston et al and Eckstein et al found 31.4% and 16% respectively. In both studies, this was attributed to the late presentation of children with cataracts to the health centers [19, 15].

Secondary membranes may form across the pupil, particularly in microphthalmic eyes or those with associated chronic uveitis. Thin membranes may be opened with Nd: YAG laser; thick ones may require surgery [15].

3.0 Study Justification/Rational

Pediatric cataract blindness presents an enormous problem in terms of morbidity, economic loss and social burden. It is thus cardinal to know how the intervention measures that are put in place help to combat this huge problem of preventable childhood blindness due to cataracts.

A blind child has many blind years ahead and therefore the number of disability adjusted years is more than in adults.

To date no study has reported long term outcome of childhood cataract surgery with IOL insertion in Africa. As such the precise data related to long term outcome of pediatric cataract surgery with IOL insertion in Africa is not known. A review of long term outcome of cataract surgery with IOL insertion in children will strengthen old methods and come up with new sugestions to improve outcome.

3.1 OBJECTIVES

3.1.1 Main Objective

"To establish the outcome of cataract in children below 15 years performed between 1996 and 2005 at KEU."

3.1.2 Specific Objectives

- To identify preexisting factors which may influence outcome of childhood cataract.
- To determine the visual outcome of childhood cataract and relate it to type of cataract and duration before intervention.
- To establish common complications and relate them to visual outcome;
- To describe the types of cataract and interventions employed.

4.0 METHODOLOGY

4.1 Study Site

The study was done at Kikuyu Eye Unit.

4.2 Study Design

This was a Retrospective study.

4.3 Study Population

Children aged below 15 years old who had cataract surgery at Kikuyu Eye Unit.

4.4 Study Period

The study reviewed the medical records of children who underwent cataract surgery from January 1996 to December 2005; a 10 year period.

4.5 Data Management

The patient's hospital files were retrieved with the help of the records department personnel. The relevant data was entered into the questionnaire which was kept safely awaiting data entry into a database designed in Microsoft access. The Principal Investigator went through each questionnaire to ensure their completion after which the data was keyed in an access database. The data was exported to Statistical Package for Social Scientist software (SSPS) version 12.5 for data analysis. The data was cleaned and validated before actual analysis. Descriptive statistics was used to describe the socio-demographic factors of the patients while Non-parametric techniques were called upon to get the statistical significance of skewed distributions and where the response of certain variable was less than 30 cases.

Independence of certain variables was subjected to chi-square test to establish association.

T-tests was also used to get the significant difference between means in the variable in question. The data was validated and analyzed using appropriate statistical test with assistance from a Biostatistician.

The findings have been presented in form of tables, graphs, and pie charts where appropriate.

The findings have been discussed, logical conclusion drawn and recommendations made and submitted to the university of Nairobi, department of Ophthalmology.

4.6 Inclusion Criteria

Records of children aged 15 years old and below who had cataract surgery done from January 1996 to December 2005 at KEU.

4.7 Exclusion Criteria

The following formed the basis for exclusion from the study; incomplete records and missing files were omitted.

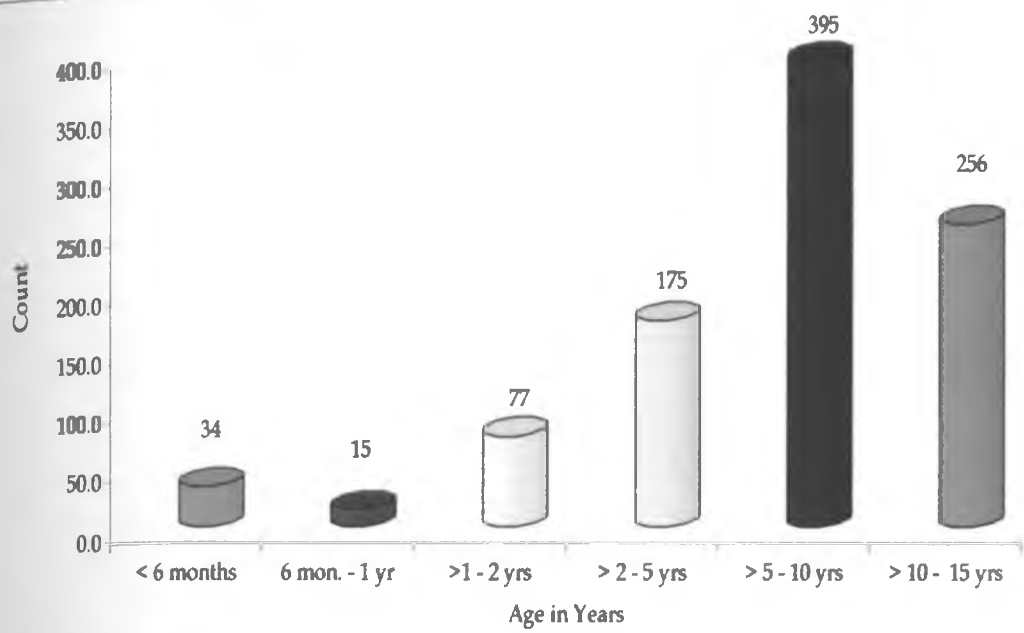
4.8 Ethical Considerarations

Patient's identity and any information were kept anonymous by the principal investigator and will not appear in any publications. The patient's files will neither be photocopied nor will the names of the clinicians /surgeons be recorded. The information on the questionnaire was accessible only to the investigator and the Biostastician.

The approval to conduct the study was sought from Kikuyu Eye Unit.

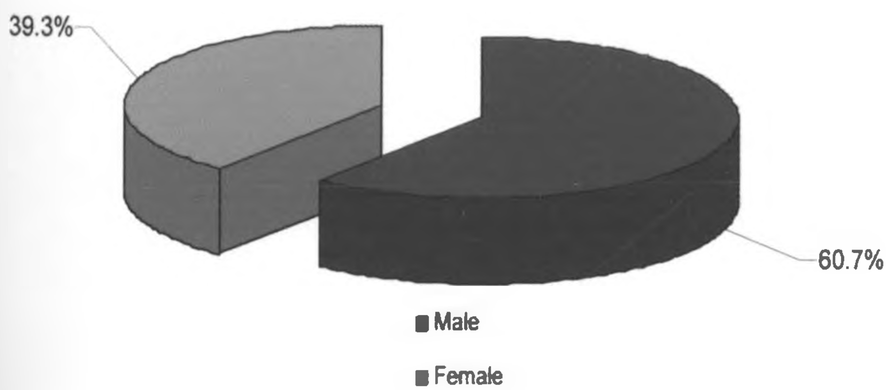
5.0 RESULTS

Figure 1: Age distribution (n = 953)



The mean age of the children was 7.4 years (std = 3.9) with the minimum age reported being 2/12 (2 months) and the oldest being 15 years.

Figure 2: Sex distribution (n = 953)



The male to female ratio was 1.5:1.

Table 1: Laterality (n = 953)

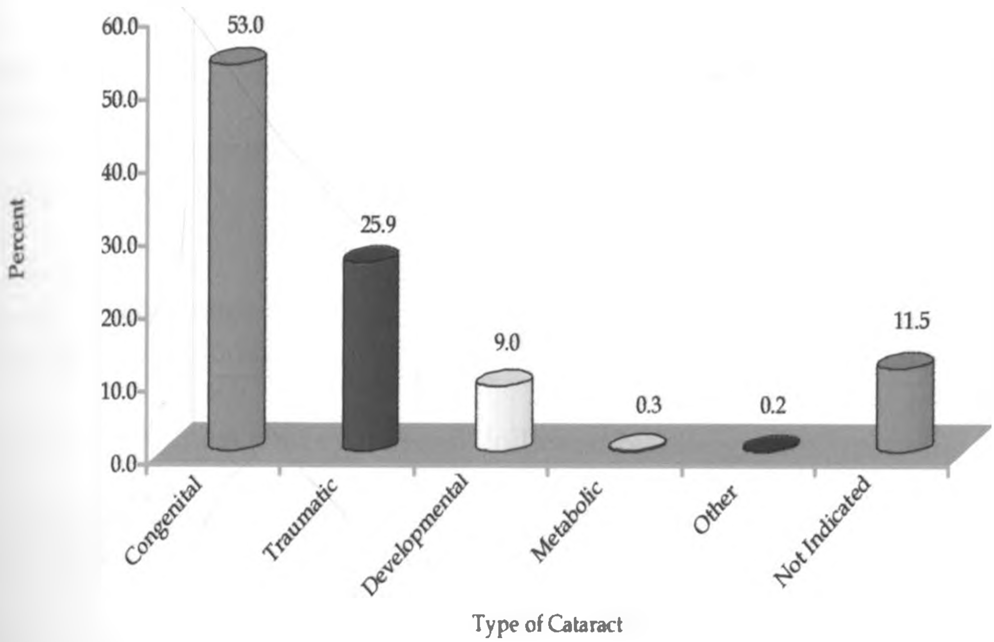
Eye	Frequency	Percentage
Bilateral	561	58.9
Unilateral		
• RE	193	20.2
• LE	199	20.9

Table 2: Duration when cataracts noted (n = 953)

Duration	Frequency	Percentage
• Less than 1 week	92	9.7
• 1 week to 1 month	77	8.1
• 1 to 11 months	96	10.1
• 1 to 5 years	334	35.0
• 6 to 10 years	79	8.3
• 11 to 15 years	14	1.4
• Not Indicated	261	27.4

All the children who had duration of one month and less (17.8%) had traumatic cataract.

Figure 3: Type of Cataracts (n = 1514)



Other type of cataract included cataract resulting from electrocution and lightening.

Table 3: History of Past Eye Disease (n = 953)

Past eye Disease	Frequency	Percentage
• No	781	82.0
• Yes	172	18.0
Trauma	**156**	**90.7**
Amblyopic	4	2.3
Allergic Conjunctivitis	6	3.5
Optical Iridectomy	2	1.2
Uveitis	1	0.6
Pale Disc	1	0.6
Opthalmia Neonatorum	1	0.6
Congenital Glaucoma	1	0.6

Trauma was the commonest past eye disease followed by allergic conjunctivitis.

Table 4: Presence of other Systemic Findings (n = 953)

Systemic findings	Frequency	Percentage
• No	897	94.1
• Yes	56	5.9
▪ **Rubella**	**12**	**21.4**
▪ Delayed Milestones	8	14.2
▪ Epilepsy	7	12.5
▪ Deaf	5	8.9
▪ Cerebral Palsy	4	7.1
▪ **Diabetic**	**4**	**7.1**
▪ Mental retardation	3	5.3
▪ Premature	2	3.5
▪ Down syndrome	2	3.5
▪ **Alports Syndrome**	**1**	**1.7**
▪ Anaemia	2	3.4
▪ Enler Dahnlos	1	1.7
▪ **Galactosemia**	**1**	**1.7**
▪ HIV	1	1.7
▪ Hydrocephalus	1	1.7
▪ **Marfan Syndrome**	**1**	**1.7**
▪ **Peters'anomaly**	**1**	**1.7**

Congenital rubella syndrome was the highest systemic finding accounting for 12 children of all the children seen.

Table 5: Pre-Operative Visual Acuity (n = 1, 514)

VA Pre-Operatively	Unilateral		Bilateral		Count	Percentage
	RE	LE	RE	LE		
6/12	58	6	64	60	188	12.4
6/18	0	1	9	15	25	1.6
6/24	1	1	22	20	44	2.9
6/30	0	1	1	6	8	0.5
6/36	2	1	22	75	100	6.6
6/38	0	0	5	6	11	0.7
6/48	0	0	52	6	58	3.8
6/60	2	6	33	32	73	4.8
6/76	0	0	1	1	2	0.1
CF	13	27	39	41	120	7.9
FL	1	0	44	46	91	6.0
HM	30	64	83	62	239	15.7
NPL	2	13	2	2	19	1.2
PL	53	40	27	33	153	10.1
Picking objects	0	0	4	3	7	0.5
Not Indicated	**29**	**33**	**157**	**157**	**314**	**25.2**
Total	*191*	*193*	*565*	*565*	*1,514*	*100.0*

Figure 4: VA pre-operative: VA (n = 1,514)

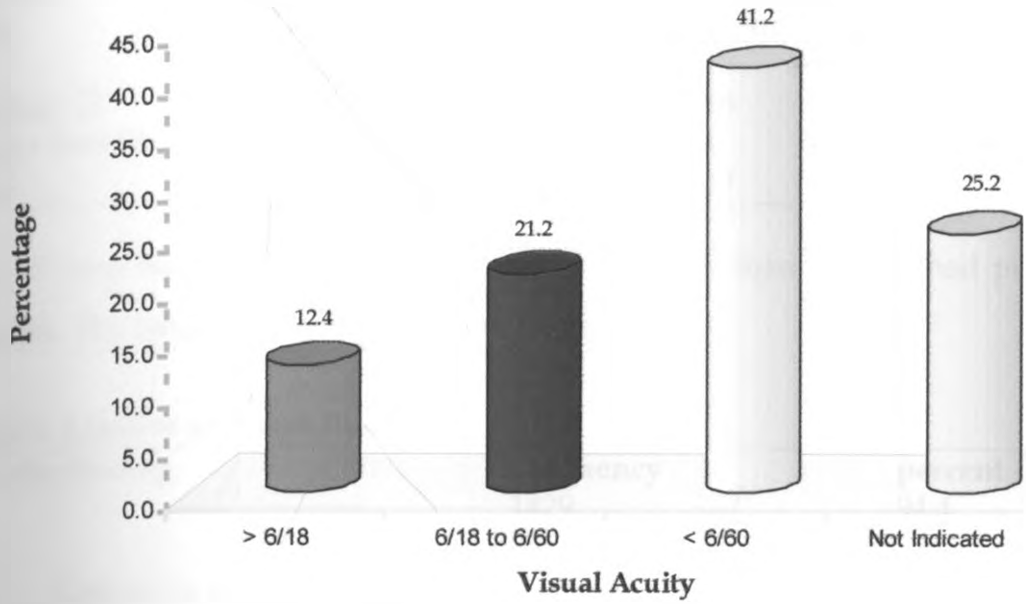


Table 6: Corneal diameter (n = 1514)

Diameter (mm)		
Not done	*1,482*	
Done	32	
	Frequency	**percent**
Less than 9	9	29.0
9	11	34.0
Greater than 9	12	37.0
Total	32	*100.0*

The corneal diameter ranged from 7.5 mm to 14.0 mm. The two eyes with corneal diameter of 14.0mm were of the child with congenital glaucoma. Those with corneal diameter less than 9mm were said to have microphthalmos. Only 32 eyes had corneal diameter measurement.

Table 7: Intra Ocular Pressure (n =1,514)

IoP (mmhg)		
Not done	*1,497*	
Done	*17*	**Frequency**
Less than 21		16
Greater than 21		1
Total		*17*

Only 17 eyes had IOP measured. The eye with more than 21 IOP had peters' anomaly. The remaining eyes had normal pressures.

Table 8: Anterior segment findings (n =1514)

Anterior finding	**Frequency**	**percent**
No	1429	94.4
Yes	85	5.6
• Corneal Scar	36	42.4
• Corneal perforation	9	10.6
• Irregular pupil	5	5.9
• Iris dialysis	5	5.9
• Posterior Synechiae	5	5.9
• Shallow AC	4	4.7
• Lens matter in AC	4	4.7
• Uveities	3	3.5
• Iris prolapse	3	3.5
• Iris tear	2	2.3
• Intumescent lens	2	2.3
• **Aniridia**	**2**	**2.3**
• Microcystic oedema	2	2.3
• Vitreous in AC	1	1.2
• Raptured lens	1	1.2
• Iris cyst	1	1.2
Total	**1,514**	**100.0**

Except for aniridia all anterior segment findings were associated with trauma. Corneal scar was the highest.

Table 9: Posterior Segment findings (n =1,514)

Anterior finding	Frequency	percent
No	1489	98.
Yes	25	2.
• Tilted Disc	3	12.0
• PHPV	3	12.0
• Macular Scar	3	12.0
• Myelinated nerve fibre	2	8.0
• Pale disc	2	8.0
• Vitrious haemorrhage	2	8.0
• Subretinal fibrosis	1	4.0
• Salt & pepper	1	4.0
• Retinitis	1	4.0
• Retinal detachment	1	4.0
• Prepapilarily membrane	1	4.0
• Macular RPE changes	1	4.0
• Ischeamic retina	1	4.0
• Commotio retina	1	4.0
• Vitreous liquifaction	1	4.0
• Retinal Scar	1	4.0
Total	*1,514*	*100.0*

Unlike anterior segment findings most posterior segment findings were not associated with trauma.

Table 10: Axial length (n = 1,514)

Axial length (mm)	Frequency	percent
< 20	180	11.9
≥ 20	826	54.6
Not indicated	508	33.5

The median axial length was 22.5, mean was 22.4 (std = 0.07), maximum was 29.91 mm with the minimum being 17.0 mm (range = 12.91).

Table 11: Surgical Technique used (n = 1,514)

Technique (mm)	Frequency	percent
Lensectomy only	38	2.5
Lensectomy + AV	16	1.1
Lensectomy + AV + IOL	**927**	**61.2**
LWO + IOL	85	5.6
LWO	5	0.4
ECCE + IOL	**326**	**21.5**
ECCE + PPC + IOL	110	7.2
ECCE only	7	0.5

Lensectomy+AV+IOL was the commonest surgical technique used followed by ECCE +IOL.

Table 12: Method of Aphakic correction (n = 1,514)

Technique (mm)	Frequency	percent
IOL only	362	24.0
IOL + Spectacles	**1,086**	**71.7**
Spectacles only	35	2.3
Other	31	2.

Other included LVA and contact lens in 5 eyes. IOL + spectacle was the preferred method of aphakic correction.

Figure 5: Complications noted during Follow - up (n = 1,514)

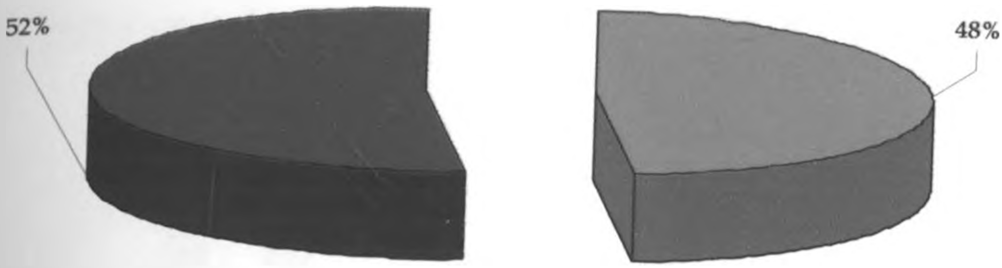


Table 13: Type of Complication noted during follow up (n = 1,514)

Complication	Frequency	percent
Without complication	726	**48.0**
With complications	788	**52.0**
• **Fibrinoid reaction**	**466**	**59.2**
• PCO	**120**	**15.4**
• Corneal haze	75	9.5
• **Amblyopia**	**36**	**4.6**
• Pupil abnormality	27	3.4
• **Strabismus**	**24**	**3.1**
• IOL decentration	23	2.9
• Glaucoma	5	0.6
• Hyphema	4	0.5
• Hypopion	4	0.5
• Endophthalmitis	1	0.1
• Pthisis bulbi	1	0.1
• AC Shallow	1	0.1

Fibrinoid reaction was noted within a duration range of day 1 and 2 weeks after surgery. The mean duration was 3 days. PCO was noted with in a duration range of 2 weeks and 33 weeks after surgery with a mean duration of 17 weeks.

Amblyopia was noted with in a duration rage of 1 week and 52 weeks after surgery with a mean duration of 28 weeks. 8% of PCO had lensectomy and anterior vitrectomy, 92% ECCE only and ECCE +PPC showed no PCO.

Figure 6: Follow -up (n = 953)

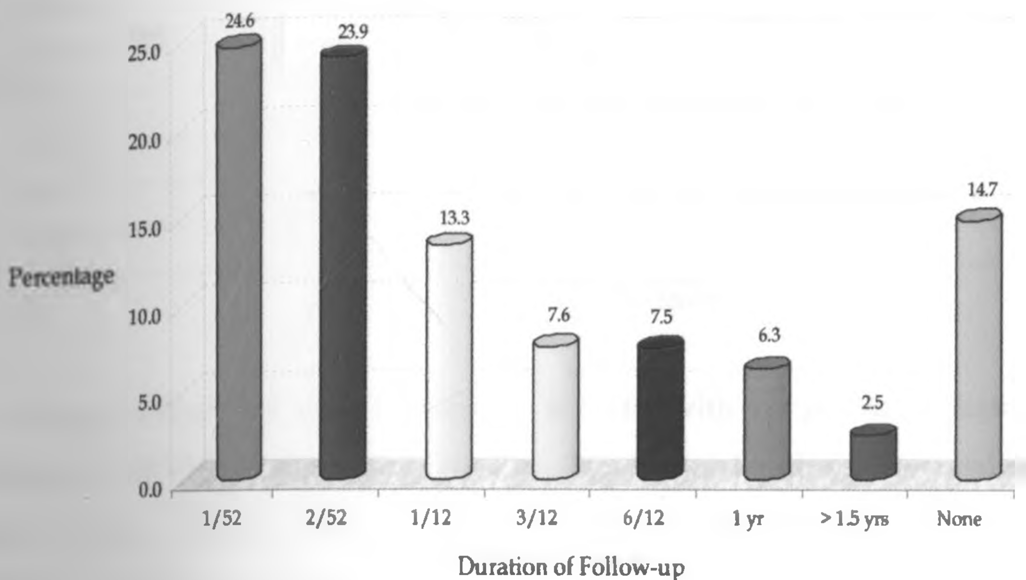
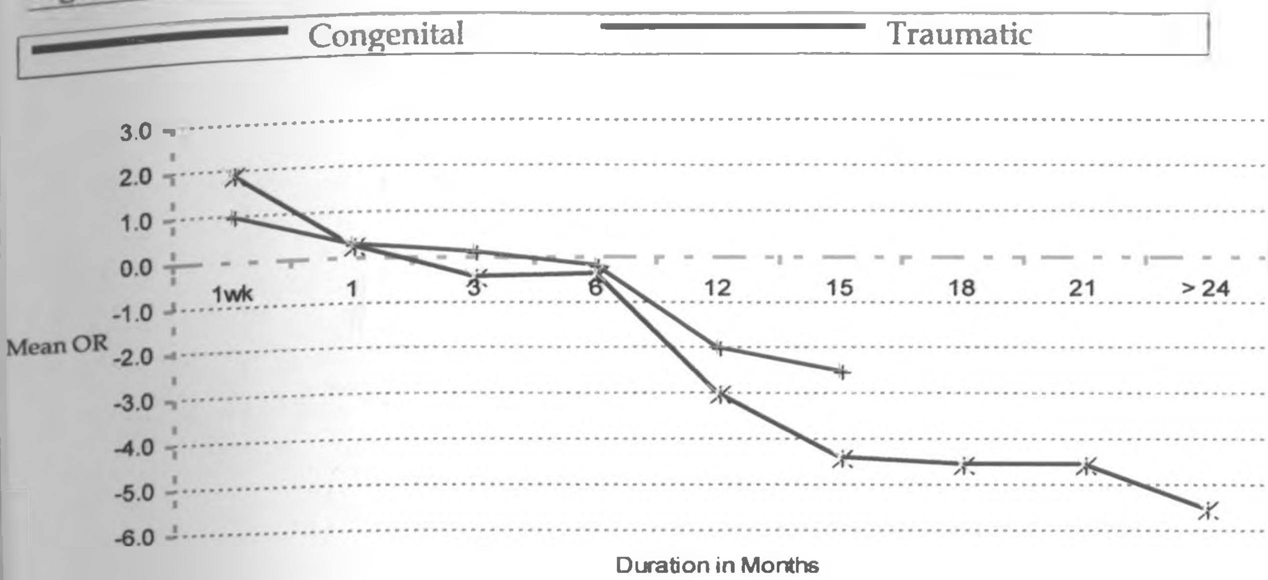
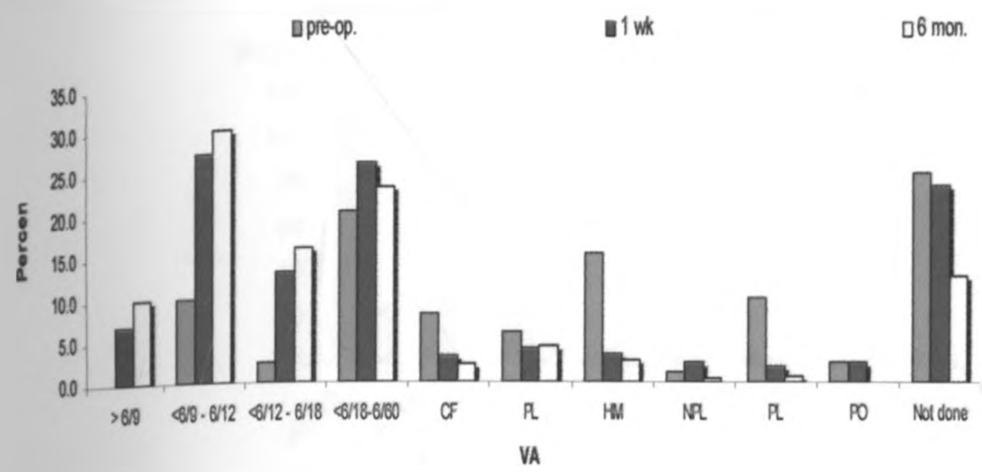


Figure 7: Refractive change with time.



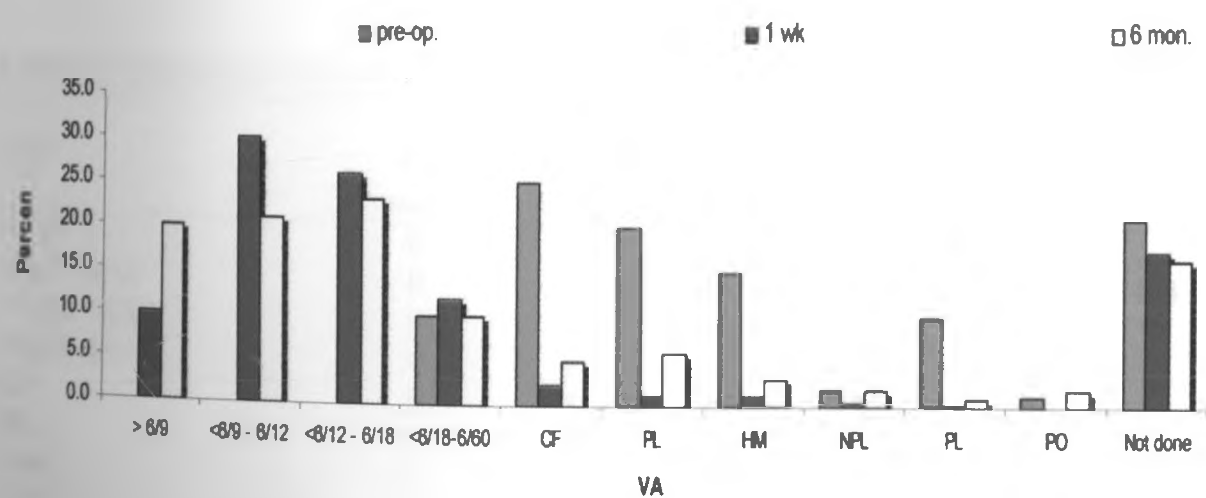
The longest follow up was 4 years in a child with congenital cataract. He presented with difficult in seeing letters on black board and was referred by the teacher. Had a myopic shift of -14.00D both eyes and was booked for IOL exchange. The second longest follow up was 3year with myopic shift of -7.00D was considered for IOL exchange but the patient did not come for surgery.

Figure 8: VA at pre-op, 1 wk & 6 months (Congenital)



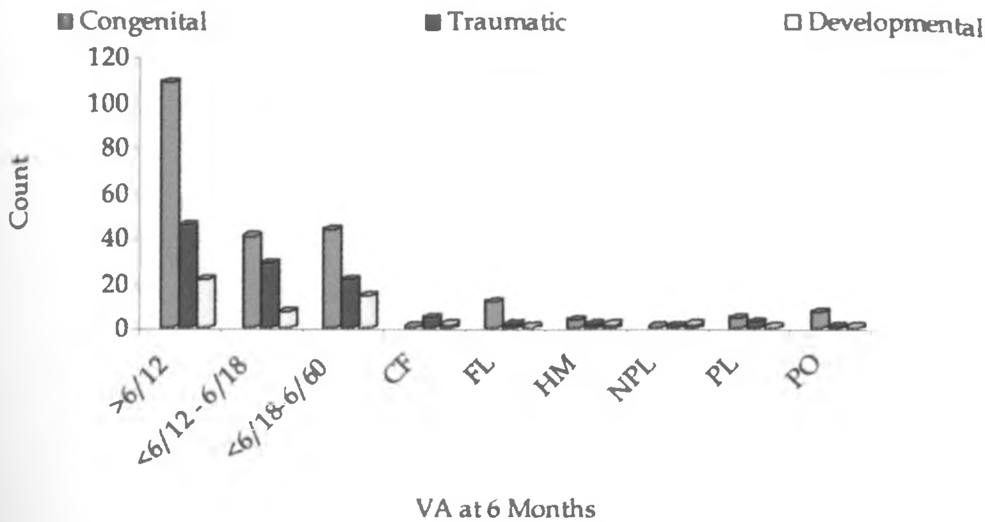
With time VA showed improvement.

Figure 9: VA at pre-op, 1 wk & 6 months (Traumatic)



In traumatic cataract vision improved tremendously except in patients who developed complication such as corneal opacity.

Figure 10: Visual Acuity at 6 months vs. type of cataract



The large number of eyes with good vision in congenital cataract may also be attributed to the large number of eyes with congenital cataract.(p-value=0.001)

Table 14: Association between Age and Visual Outcome at 1 week (n = 1,311)

VA	Age distribution					
	< 6 mon.	6-11 mon	1-2	3-5	6-10	11-15
> 6/9	0	0	0	4	13	25
<6/9 - 6/12	0	0	0	35	110	104
<6/12 - 6/18	0	0	0	25	37	70
<6/18-6/60	0	0	0	114	143	95
CF	0	0	0	15	25	17
FL	24	13	52	9	2	6
HM	0	0	5	15	13	14
NPL	0	0	0	2	3	2
PL	0	0	0	1	0	0
PO	1	6	18	5	0	0
Not done	29	5	46	46	197	7

Table 15: Association between associated pre-op ocular findings and visual acuity

VA	Nystagmus			Strabismus			Microphtalmos		
	Pre-op.	1 wk	6 mon.	Pre-op.	1 wk	6 mon.	Pre-op.	1 wk	6 mon
> 6/9	0	0	0	0	1	2	0	1	0
<6/9 - 6/12	0	4	0	0	4	7	0	0	0
<6/12 - 6/18	2	2	4	0	6	4	0	0	1
<6/18-6/60	9	16	7	15	29	8	0	4	4
CF	7	0	1	3	2	0	6	1	0
FL	10	8	2	15	6	6	8	9	4
HM	6	6	1	9	3	1	1	1	1
NPL	0	2	0	0	0	0	0	0	0
PL	1	1	1	12	3	0	3	1	2
PO	2	2	6	3	11	0	0	0	0
Not done	19	18	4	23	16	6	7	8	0

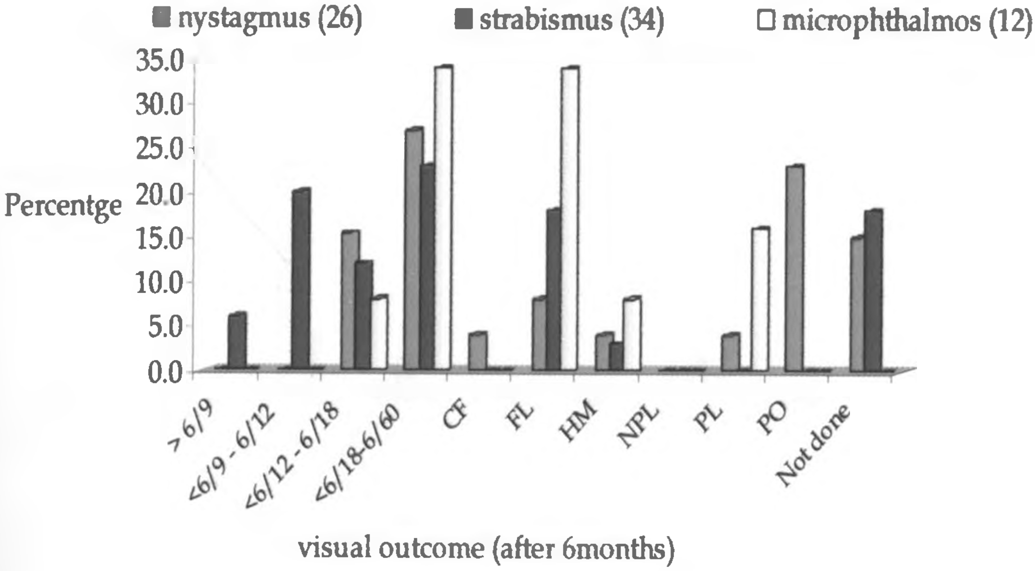
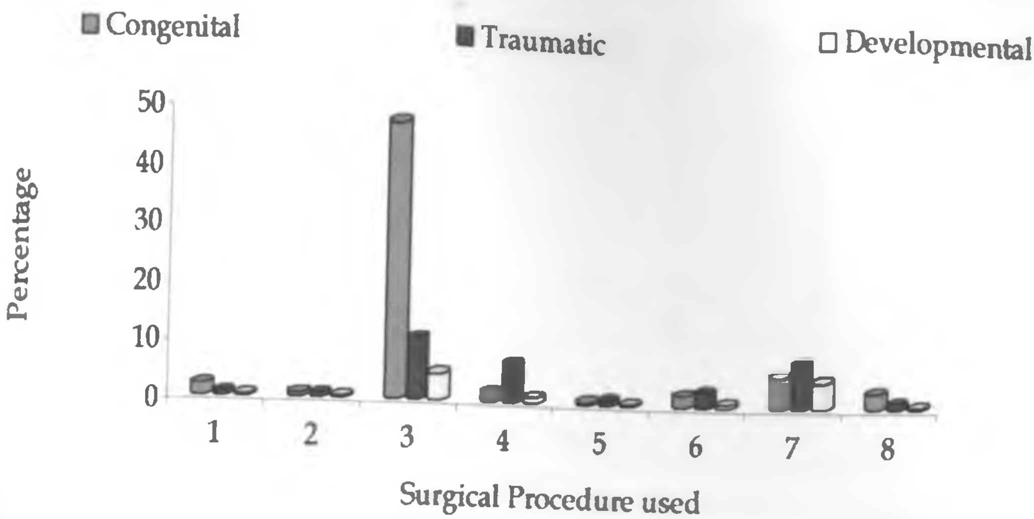

nystagmus (26)
strabismus (34)
microphthalmos (12)
Percentge
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
>6/9
<6/9 - 6/12
<6/12 - 6/18
<6/18-6/60
CF
FL
HM
NPL
PL
PO
Not done
visual outcome (after 6months)

Figure 12: Surgical Procedure vs. Type of Cataract



P-value <*0.001*

KEY

Lens. Only	1
Lens. + AV	2
Lens.+AV+IOL	3
LWO+IOL	4
LWO only	5
LWO +IOL+PPCAP	6
ECCE+IOL	7
ECCE+PPCAP+IOL	8

Table 16: Delay in presentation vs. visual outcome.

Pre-Duration	> 6/12	<6/12-6/18	<6/18-6/60	CF	FL	PL	HM	NPL	PO	Not done
< 1 mon.	11	12	0	1	1	1	1	0	0	48
1-6mon.	60	3	14	1	6	2	0	0	4	120
7-11mon.	0	0	0	0	0	0	0	0	0	14
1-3yrs	22	4	1	1	1	0	1	1	0	329
4-7yrs	9	4	7	7	7	0	2	1	0	127
7-10yrs	6	1	2	0	0	0	0	0	0	22
>10yrs	1	1	0	0	0	0	0	0	0	17

Table 17: Delay in presentation vs. Type of Cataract

	Type of Cataract		
Statictics	Congenital	Developmental	Traumatic
Median	2 years	2 years	1 month
Minimum	1 month	6 month	0 days
Maximum	14 years	10 years	13 years

The mean waiting time before presentation was significant with a p-value **< *0.001***

6.0 DISCUSSION

Discussion:

A total of 953 files of children who were operated on for cataract were reviewed. 39.3% of the children were female and 60.7% were male (Figure 2). In the previous study done at kikuyu eye unit Yorston found that 69% of the children were male ([illegible]). In a study done in Tanzania Mwende found that of the children who presented with cataract 55% were male and 45% were female(33). The preponderance of male patients is more likely the result of the greater value accorded to male children in traditional societies, rather than to an increased incidence of cataract in boys.

The minimum *age on operation* was two months and the maximum age was 15 years. The mean age was 7.4 years (Figure 1).In Yorstons' study the average age of the patients at their first operation was 3.5 years. Twenty eight patients were under 2 years old at surgery, 20 were aged between 2 and 5, and 23 were over 5 years old at their first operation (19). The differences in average age at presentation could be explained by the fact that Yorston looked at only bilateral cataract which is more likely to present earlier than unilateral cataract. He also excluded traumatic cataract. In this study both traumatic and unilateral cataracts were included.

A child with cataract often stays at home as parents are probably unaware that the child is suffering from a treatable condition.

A child with cataract often stays at home as parents are probably unaware that the child is suffering from a treatable condition. Worse still children do not usually complain of symptoms. Sometimes a child may not be noticed to have a cataract at primary level health care centre.

The other reasons that may explain late presentation of children with cataract are due to perceptions and behavior of family and community members. These include perceptions such as, cataract occurs only in elderly people or that congenital blindness cannot be treated. Other members of the family or community may take it as a curse or punishment from the gods. While other family members may opt to wait for the child to learn to see or for the white spot to disappear. Some parents may accept the blindness and decide not to seek treatment or advice (6).

The highest numbers of cataracts were congenital followed by traumatic cataracts. Definition by age at onset, a congenital cataract is visible in the first year of life. However in this study children who presented several years after there first birth day and had a history of leucokoria for less than a year were still diagnosed as congenital cataract .This may explain the low number of developmental cataracts diagnosed. Metabolic cataracts were the least in number (figure 3). In Uganda Waddell etal found that 13.8% of the childhood cataracts had a familial association where as in Kenya Yorston etal found 12.5% to have familial association. In both studies no other causative factors could be determined (2, 19).

Trauma, both blunt and penetrating was an important cause of cataract in this study. It was evidenced by an increased number of trauma associated anterior segment findings (table 8).
Significant systemic findings also occurred in 5.9% of the children studied (table4).

The commonest systemic association was congenital rubella syndrome accounting for 21.4 %(12 children) of the children who had systemic associations. This can be explained by the fact that the women who had these children with congenital rubella were not vaccinated against German measles (Rubella). Most likely these mothers did not have their vaccine in infancy and during there teens. Another explanation could be that these mothers had no natural immunity to rubella.

Pre-operative visual acuity ranged from 6/12 to NPL (figure4). About 25.2% (378 eyes) of the eyes did not have their visual acuity done. 12.4% (180 eyes) of the eyes with visual acuity better than 6/18 where eyes in children with bilateral cataract. These should have been coming from far and not operating would mean the child may never have the cataract removed.

Measuring visual functions in children is not straight forward, the visual system is relatively immature at birth and development is particularly rapid in the first year of life, it continues into late childhood. Acuity is the most frequently measured visual function. Despite the development of methods appropriate to different ages, measuring acuity remains difficult in infants, pre-school children and those with other disabilities(6).

In this study most infants and pre-school children were tested using visual fixation to light (torch) and cardiff. Children who could not respond to any of these tests, no visual assessment was indicated (figure 4).
In co-operative children aged 2 years and above picture optotypes were used at different distances and this was converted to Snellen acuity. For school going children who knew how to read Snellen visual acuity charts were used.

The commonest surgical technique used was lensectomy + anterior vitrectomy + IOL accounting for 61.2% (923 eyes), followed by ECCE + IOL which accounted for 21.5%(317 eyes) (table11).
Introduction of instruments with cutting and aspirating capabilities such as the automated vitrector provided a valuable new approach to removal of the pediatric cataracts. Since the perils of leaving behind residual lens material were well recognized, surgeons attempted to achieve nearly complete removal of the lens and found the automated vitrector ideally suited for this purpose.
The peripheral portion of the capsular bag is retained in this procedure, this providing the option of subsequent IOL implantation. This procedure provides a permanently clear visual axis as long as anterior vitrectomy is deep enough (7).
In this study 8% (74eyes) of the eyes who had lensectomy +AV developed PCO. This can be explained by the fact that inflammatory response in small children is severe and fibrous membrane may have formed on the anterior vitreous face.
This could have acted as a scaffold not only for equatorial cell migration and proliferation but also for metaplastic epithelial cell and the cells that result from break down of the blood aqueous barrier(7).
92% of all the PCO occurred in eyes with ECCE without primary posterior capsulotomy. This is because in this procedure the posterior capsule acts as a scaffold for equatorial cell migration and proliferation. This occurred even in children who were above 8 years.

Other workers have also showed the occurrence of PCO following childhood cataract surgery. Yorston et al looked at 118 eyes (71 patients) with a mean age of 3.5years and mean follow up of 3months. He reported that 56 eyes had anterior capsulotomy and lens aspiration only and of these, 35.7% developed PCO. The other 62 eyes had primary posterior capsulotomy plus anterior vitrectomy of these only 1.6% had PCO (19).

Eckstein et al studied 112 eyes, 56 patients with an age range of 3 months to 10 years (mean age 53 months) with a mean follow up of 3 years. 56 of the eyes had lens aspiration with primary posterior capsulotomy only, 66.1% of these had PCO, 56 of the eyes had lensectomy and vitrectomy and only 1.8% of these had PCO (15).

Elschnig Pearls (bladder cells, wedl cells) are caused by the proliferation and migration of residual equatorial epithelial cells along the posterior capsule at the site of apposition between the remnants of the anterior capsule and posterior capsule. They impart a vacuolated appearance to the posterior capsule, best visualized on retro illumination. This is the most frequently seen type of opacification and is related to the patient's age. It is extremely common in children if a posterior capsule rhexis is not performed at the time of surgery. Capsular fibrosis, due to fibrous metaplasia of epithelial cells is less common and usually appear earlier than Elschning Pearls (28).

Surgeons usually perform anterior vitrectomy along with primary capsulotomy. Recent reports, however, suggest that it may not be necessary in all cases. It is also not known whether age is a relevant factor or below what age the procedure should be considered mandatory (7).

Gimbel and co-workers have expressed concern about the effect of vitreous removal on ocular development in young eyes. According to them, modern cataract surgery has made routine anterior vitrectomy unnecessary in children . above 2 years (29).

I believe that the anterior vitreous face is more reactive in infants and young children and hence should be removed. Anterior vitrectomy also places the vitreous face posterior to the plane of the iris thus reducing posterior synechiae formation.

Post operative inflammation (fibrinoid reaction) was the commonest complication noted. It accounted for 59.2%(466 eyes) of the complications (table13). It is a common occurrence post operatively and various studies have reported an incidence of 19 to 81% (30)
This can be explained by increased tissue reactivity of peadiatric eyes. Its pathogenesis is unclear but involves a breakdown of the blood ocular barrier by inflammation and dysfunction of the coagulation and fibriolytic pathways. The other probable explanation of increased fribrionoid reaction would be that the adult size IOLs used caused excessive pressure on uveal structures and produced inflammation particularly when they were placed in sulcus (30).
This could also explain the decenteration as the haptics are often compressed unevenly in the small eyes of a child.

Amplyopia was the third commonest complication. It accounted for 4.6% of the complications (table 13). Yorston et al and Eckstein et al found 31.4% and 16% respectively.
In both studies, this was attributed to the late presentation of children with cataracts to the health centers. The low number of amblyopia noted in this study would be an under estimation of the existing situation in view of poor follow up.

Aphakic corrections was mostly with IOL+spectacles accounting for 71.4%, IOL only 42.0%, spectacles only 2.3%. Contact lens use is still not popular at Kikuyu eye hospital (table 12).

Disadvantages of the contact lens include its high cost and limited durability, replacement is usually necessary after about six months of wear because of surface deteriorations. Very young users of contact lens suffer from the burden of relatively frequent lens loss and the need for unpleasant physical restraint during insertions and removal. Lens fitting and retention are especially a problem after penetrating injury because of corneal irregularities.

The frequency of infectious keratitis in contact lens wearing pediatric aphakes may be higher than for other categories of lens wearer especially when hygienic conditions are sub-optimal. The above disadvantages of contact lens in developing countries outweigh its benefits (7).

This explains why contact lenses are rarely used at Kikuyu eye hospital. Glasses have a considerably larger role to play in the post operative management of pediatric than adult cataract. Children under age 10 years with bilateral aphakia generally adapt very readily to the magnifications and distortions produced by high plus spectacles lenses.

Unilateral childhood aphakes suffer loss of binocularity if they must rely on glasses and find the qualities of spectacle corrected aphakic vision objectionable in comparison to the preserved phakic vision of the fellow eye.

For infants following cataract surgery spectacle fitting is quite difficult, both because their faces are poorly suited to supporting the weight of high power required (frequently in excess of +20D).The high power spectacles are also hard to obtain (7).To circumvent the problems associated with CL and spectacles, IOL implantation is being used even in children below 2years.

Even if an IOL is used there will be residual refractive error and spectacles will be necessary to get the best possible vision. This explains the high frequency of IOL + spectacles correction of aphakia (table 12).

Follow up in the study was very poor. Only 24% of the operated children returned for first visit and 2.5% had more than one and half years of follow up (figure6). Gradin et al noted in there study that only 23% of the patients were followed up for more than a year (31).

Unlike cataract surgery in adults, long term, regular follow up over several years and optical correction after surgery are critical to achieving a good visual outcome in children. Commitment from parents is required but difficult to achieve. Again there are major barriers.

Barriers specific to children are that children usually do not complain of worsening vision (for example due to posterior capsular opacifications), they need someone to detect the problem during follow-up and they do not present themselves to health workers, they need parents or another adult to decide and act on their behalf.

The other barrier concerns perceptions and behavior of family and community members. Often adult patients are told that there is no need to come back after cataract surgery if they continue to see well, unfortunately this message is generalized to children leading to the belief that there is no need for long term follow -up in children. There is also perception related to the surgery itself. If the surgery is good, you do not need to go back to the doctor and if the surgery was bad family members may think ,if the child cannot see well, what is the point of going back for follow up. This is compounded by cost of follow up visit and treatment. This may be based on the cost of initial visit and surgery (6).

Family and community members are not to be the only ones to bear the blame for poor follow up in children who have had cataract surgery, lack of clear communication from service providers, "No one told us to go back for follow-up, we went for follow-up after two weeks and the doctor said every thing is fine and the eye looks good" may contribute to poor follow-up.

Lack of referral linkages between local service providers and eye hospitals and lack of counseling services for the parents to motivate them to attend follow-up visits for the child may significantly play a role in the poor follow-up seen (6).

Though follow-up was poor some interesting changes in refraction of the operated eyes were noted in both traumatic and congenital cataract (figure 7). It was difficult to note the pattern of refractive change in developmental cataracts due to extreme poor follow-up and low numbers of developmental cataract.
From figure 7 the refractive change becomes more myopic with time. The change was steeper in congenital than traumatic. This could be explained by the fact that most of the children with congenital cataracts were younger and had been followed up for a longer time than the traumatic cataracts. It is also important to note that there were more children diagnosed as congenital cataracts compared to traumatic cataracts.
Other workers have reported a similar change in refraction, following cataract surgery in children. Gouws et al documented that there was a mean refractive shift between first refraction after surgery and refraction at 36 months after surgery of -3.44 dioptres with a very wide range (+2.00 to -15.50).
There was a significantly greater myopic shift in the unilateral cases. Many eyes in both groups continued to show an increasing myopic shift between 36 months after surgery and their final recorded refractions (10).

A study in Japan showed that there was no significant difference in the mean change in refraction over four years among three age groups (group 1:<=5, group 2: 6<<=10, group 3 : 11<<=15 years old).
However several patients aged 10 years old or younger showed severe myopic changes. They concluded that power calculations formulae show less accuracy on pediatric cases and that it is also difficult to predict the change of refractions on pediatric cases (25).

Selection of lens power has been one of the most controversial topics relating to pediatric IOL implantation. It is well known that the power required for aphakic correction declines precipitously during the first year of life and a considerable further degree during the ensuing childhood years . This is due to an increase in the axial length of the eye ball, the lens becomes less spherical and greater curvature from the initially flat appearance of the cornea at birth. The cornea attains the normal adult diameter by the age of two years. Thus, a pseudophakic eye that is emmetropic at age 1 year may become 5-10 diopters myopic by maturity(7).

There is however, a lack of long-term follow-up data on which to base predictions of the ultimate refraction of an eye that receives an IOL early in childhood (7). Even in this study an attempt to evaluate the long-term refractive change has been frustrated by poor follow-up.

Visual acuity in congenital cataract showed improvement with time (Figure 8).This can be explained by the fact that with time inflammation settles down making the optical medial clearer and the residual refractive error is corrected. Traumatic cataract also showed great improvement except in those who had complications such as corneal scar (figure 9).

It is however important to note that most of these children with visual acuities post operative were above three years. Visual acuities for children less than 3 years were not done and if done were recorded as picking objects or using terms such as following light and fixation.

Traumatic cataracts showed a larger number of eyes with visual acuity above 6/18, followed by congenital cataract and developmental had the least. This is likely to be due to the fact that traumatic cataracts presented early and had not developed amblyopia unlike congenital and developmental cataracts. (Fig10).

It was difficult to associate age and visual outcome because visual acuity in children less than 3years was not done and if done terms such as picking objects and following light which are not measurable were used. Again majority of the children were not assessed for visual acuity (table 14)

At six months eyes with strabismus showed better visual acuity followed by nystagmus. microphthalmos had the least improvement in visual acuity (figure 11).This can be explained by the fact that eyes with microphthalmos could be associated with other ocular anomalies such as colombomas and optic nerve hypoplasia or it could be that they were few in number compared to the other two ocular associations.

The commonest surgical procedure used in all the three types of cataract was lensectomy +anterior vitrectomy +intraocular lens (figure 12).This is probably based on published studies of Yorston et al, and Sandford-Smith. These studies recommended that primary posterior capsulotomy and anterior vitretomy provide the best option for a long term clear visual axis, especially when long term follow-up is not likely and Nd: Yag laser treatment is not available. (16, 19).

Association of delay in presentation and visual outcome was difficult to determine because of poor follow-up and some of the children who came for follow-up their visual acuity was not taken (Table 16).

7.0 Conclusion

It was not possible to accurately determine long term outcome because of poor follow up .However the following observations were made.

- Visual outcome improved with time post operatively.
- There was myopic shift observed with time post operatively.
- Fibrinoid reaction and PCO are common in children.
- Nystagmus and strabismus did not affect visual outcome as did microphthalmos at six months.
- The commonest type of cataract was congenital followed by traumatic and developmental. Traumatic cataract had the best outcome followed by congenital cataract.
- The commonest interventions employed were lensectomy +AV +IOL, ECCE+IOL, ECCE+PPC+IOL, in decreasing order.

8.0 Recommendations.

- Address barriers to follow up of children after cataract surgery.
- All children coming in with associated ocular findings such as nystagmus and strabismus should be operated.
- All children should have primary posterior capsulotomy except in centers where yag laser is available and the child is cooperative enough to do yag laser capsulotomy. Most of the children above 8 years of age will be cooperative enough to do yag capsulotomy.

When ever IOL implantation is considered in a child the refractive change (myopic shift) that occurs with time must be borne in mind. There is no clear guideline as to what power of IOL should be put in because the change in refraction is unpredictable (7, 21).

10.0 Appendices

10.1 References

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10.2 Questionnaire

A. Socio-demographic data

Patient's Name ______________________

P/No. ______________________

Sex ☐ Male ☐ Female

Age ☐ months.

B. Pre-Operative Evaluation

Eye affected ☐ RE ☐ LE Both.....

	RE	LE
Duration of cataract	☐	☐
Strabismurs	☐	☐
Nystagmus	☐	☐
Leukokoria	☐	☐
Photophobia	☐	☐

Type of cataract RE ____________ LE ____________

Vision at present RE ____________ LE ____________

Corneal Diameter RE-H: ____________ LE–H:

____

V: ____________ V: ____________

IOP Pre-Operatively RE ____________ LE ____________

	RE	LE
Posterior Segment Accessible	☐	☐
Findings	☐	☐
Not Accessible	☐	☐

Axial Length RE ____________ LE ____________

Keratometry RE ____________ LE ____________

IOL Power RE ____________ LE ____________

Estimated Post-Operative refraction RE ____________ LE ____________________

Actual Post-Operative refraction RE ____________ LE ____________________

C. Surgical Techniques

Lensectomy + Anterior Vitrectomy

1. Limbal RE ____________ LE ____________________
2. Pars Plicata RE ____________ LE ____________________

Extracapsular Cataract Extraction (ECCE)

	RE	LE
1. ECCE + PPC + AV + IOL	☐	☐
2. ECCE + PPC + AV	☐	☐
3. ECCE + IOL	☐	☐
4. Others	☐	☐ Specify __________

D. Method of Aphakic correction

IOL only	☐
IOL + Spectacles	☐
IOL + Cantact lens	☐
Other (Specify)	☐

E. Post Operatively Complications

(Tick all that applies)	RE: Days PO		LE: Days PO	
Amblyopia	☐	______	☐	______
Posterior Capsular Opacity	☐	______	☐	______
Decentered IOL	☐	______	☐	______
Glaucoma	☐	______	☐	______

Endophthalmitis	☐	______	☐	______
Uveitis	☐	______	☐	______
Pupil Decentration	☐	______	☐	______
Secclusio/Occusio	☐	______	☐	______
Corneal Haziness	☐	______	☐	______
sOther		______	☐	______

Specify ______________

F. <u>Visual Acuity Post-Operatively</u>

		RE	LE	BCVA
Up to	2/52	______	______	______
"	6/52	______	______	______
"	3/12	______	______	______
"	6/12	______	______	______
"	2 years	______	______	______
"	3 years	______	______	______
"	4 years	______	______	______
"	5 years	______	______	______
"	7 years	______	______	______
"	10 years	______	______	______

G. Refractive Changes Post-Operatively

		RE	LE	BCVA
At	3/12	________	________	________
"	6/12	________	________	________
"	1 year	________	________	________
"	2 years	________	________	________
"	3 years	________	________	________
"	4 years	________	________	________
"	5 years	________	________	________
"	7 years	________	________	________
"	10 years	________	________	________

H. Duration of Follow up ____