

# VISUAL RECOVERY AFTER CATARACT SURGERY IN CHILDREN

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## SUMMARY

**Objective:** To evaluate the visual outcome of cataract surgery in children aged 16 years and below at the University College Hospital (UCH), Ibadan.

**Methods:** A retrospective review of the case records of patients aged 0-16 years who had cataract surgery at the UCH Ibadan between January 1995 and June 2006.

**Results:** One hundred and fifty-one eyes of 101 patients were studied. Eighty-four eyes (55.6%) had congenital cataracts, 25.2% were developmental, while 13.9% were secondary to trauma. Seventy-one (70.3%) patients had bilateral cataracts. Eighty-nine (58.9%) of the eyes had an associated ocular pathology. Ninety-eight eyes (64.9%) had extracapsular cataract extraction without intraocular lens implant (ECCE), while 50 eyes (33.1%) had extracapsular cataract extraction with posterior chamber intraocular lens implant (ECCE+PCIOL). Primary capsulotomy was performed on 34 eyes (22.5%). Post-operative complications were observed in 119 eyes (78.8%); with posterior capsule opacity occurring in 41.1%. Thirty-five eyes (38.9%) of those with objective visual acuity had a visual outcome of  $\geq 6/18$ . A visual outcome of 6/18 or better was significantly associated with increasing age ( $p=0.007$ ) and the use of PCIOL implants ( $p=0.005$ ), while poor visual outcome ( $\leq 6/24$ ) was significantly associated with onset of cataract at birth ( $p=0.001$ ); the presence of other ocular pathology ( $p=0.03$ ); and a long delay between presentation and surgery ( $p=0.02$ ).

**Conclusion:** The visual recovery of children who underwent cataract surgery in Ibadan is encouraging and the surgical results are likely to improve with increased proficiency in IOL implant surgery. The establishment of well-equipped and well-staffed paediatric ophthalmology centres would be beneficial in improving outcomes and would therefore help in achieving the goals of 'Vision 2020: The Right to Sight'.

**Key words:** visual outcome, children, cataract surgery, Ibadan, right to sight

## INTRODUCTION

Cataracts remain one of the most important avoidable causes of blindness in children.<sup>1</sup> Preventing childhood blindness is one of the main targets of 'Vision 2020: The Right to Sight'.<sup>2</sup> There are an estimated 1.4 million blind children worldwide.<sup>3</sup>

The proportion of childhood blindness due to cataract is estimated to be 14% globally (about 200,000 children)<sup>4</sup> while every year 20,000 to 40,000 neonates are born with congenital cataract.<sup>1</sup>

The burden of this disease disproportionately affects the developing world, where the prevalence of cataract blindness is 10 times higher than in developed countries.<sup>3</sup>

Paediatric cataract is said to be responsible for 10 million blind-person years and thus presents an enormous problem especially to developing countries in terms of human morbidity, economic loss, and social burden.<sup>5,6</sup>

Congenital cataract is the most common cause of treatable childhood blindness.<sup>1</sup> Also because children are more prone to both blunt and penetrating ocular injuries, traumatic cataracts constitute a significant cause of ocular morbidity.

The treatment of cataracts in children involves cataract extraction and amblyopia therapy; the aim of cataract surgery in children is to enable the acquisition or the restoration of normal visual function.<sup>7</sup> Therefore, evaluating and monitoring the visual outcome of paediatric cataract surgery is imperative in achieving the goal of reducing childhood blindness. The visual outcome of paediatric cataract surgery is an important

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indicator of the impact of this intervention on childhood blindness.

Managing cataracts in children remains a challenge, as treatment is often difficult, tedious, and requires dedicated team effort,<sup>6</sup> the most important members of the team being the parents of the child.<sup>8</sup> More so, the treatment of an infant or child with a cataract requires a different decision process and surgical technique compared with the treatment of an adult with a cataract.<sup>9</sup> A number of special procedures and complications are associated with childhood cataract, such as the need for general anaesthesia; the presence of nystagmus, amblyopia, or other ocular abnormalities; and difficulties with optical rehabilitation.

Various surgical procedures have been used to treat paediatric cataract including lens aspiration, lensectomy, extracapsular cataract extraction (with or without primary posterior capsulotomy), and anterior vitrectomy. Phacoemulsification and small incision cataract surgery have also been used.<sup>10,11</sup>

The recommended paediatric cataract surgical protocol is extracapsular cataract extraction (ECCE) with primary posterior capsulotomy (PCAP), anterior vitrectomy (AV), and IOL implantation.<sup>12</sup> This technique is not readily available in developing countries due to the high cost of the equipment. Surgical outcomes using other protocols have often been poor.<sup>6,12,13</sup> Optical rehabilitation generally involves the use of aphakic spectacles (especially for bilateral cataracts), contact lenses and epikeratoplasty. However, the price and maintenance of contact lenses make them impractical for most families in the developing world, while aphakic eyeglasses are often lost or damaged.<sup>12</sup> Thus, recently intraocular lens implants have become popular and are used frequently in children older than 2 years with good results (visual outcome of better than 6/24 ranging between 64% and 74%).<sup>14-19</sup>

In addition, widely varying results of visual outcome following paediatric cataract surgery have been reported by different studies depending upon the selection of patients and the type of cataract studied.

Yorston et al.,<sup>13</sup> in Kenya, reported that 44% of children with bilateral cataracts had post-operative visual acuity of  $\geq 6/18$ . Thakur et al.<sup>12</sup> in Nepal studied bilateral, unilateral, and traumatic cataracts and found that 40.5% of all the children had post-operative visual acuity of  $\geq 6/18$ . In India, Eckstein et al.<sup>20</sup> reported a visual outcome of better than 6/18 in 67% of children with traumatic cataracts.

In Ireland, O'Keefe et al.<sup>21</sup> (Ireland) reported a visual outcome of  $\geq 6/12$  in 83.3% of their patients with congenital and developmental cataracts who had bilateral IOL implants. Cassidy et al.<sup>22</sup> (UK) observed a visual outcome of  $\geq 6/12$  in 73.5% of all patients less than 5 years of age. Francis et al.<sup>23</sup> (UK), however, had a low success rate; only 46.8% of the patients they studied with

isolated inherited congenital cataract had post operative visual acuity of  $\geq 6/12$ .

Other factors affecting the visual outcome of paediatric cataract include age at onset of cataract; age at surgery/timing of surgery; laterality of the cataract; presence of a coexisting ocular pathology; compliance with optical correction and amblyopia treatment and post-operative complications.<sup>24</sup>

Intraocular lens implantation is also becoming popular in Nigeria but, little information exists on the visual outcome and post-operative complications of cataract surgery in Nigerian children. The aims of this study are to identify the factors affecting the visual outcome of paediatric cataract surgery and to describe the post-operative complications following cataract surgery in children at UCH, Ibadan with a view to making recommendations for improving the outcomes of patients undergoing paediatric cataract surgery in the developing world.

## METHODOLOGY

The study was informed by a retrospective review of the case records of all patients aged 0-16 years who had undergone cataract surgery at the UCH, Ibadan between January 1995 and June 2006. The patients were identified from the operations register for the study period. Patients whose case records were either incomplete or unavailable were excluded from the study. Data was obtained from the case records using a protocol for the following variables: age at presentation, sex, preoperative visual acuity, type of cataract, associated ocular and systemic disease, type of cataract surgery performed, intra-operative and post-operative complications, method of optical rehabilitation, and final post-operative visual acuity. Visual acuity measurements were performed using Snellen's chart and Kay's picture chart. All surgeries were performed under general anaesthesia with endotracheal intubation.

The outcome measures assessed were the occurrence of complications and final visual acuity.

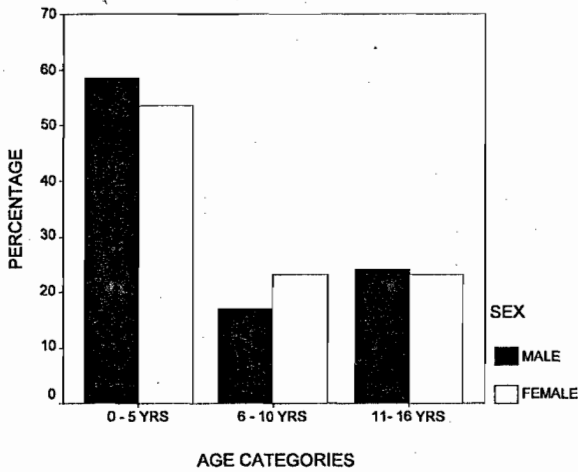
Data collected was analysed using SPSS for Windows version 11. Frequency distribution tables were obtained and bivariate analysis was conducted using Chi-square tests to observe associations between the variables and final visual outcome.

## RESULTS

A total of 196 paediatric cataract operations were performed within the study period, however, only the clinical records of 151 eyes of 101 patients were available for study.

The ages of the patients ranged between six weeks and 16 years with a median age of five years. There were 58 boys and 43 girls (M/F ratio = 1.3 : 1). Figure 1 shows the age and sex distribution of the patients. Eighty right eyes and 71 left eyes were studied. Seventy-one (70.3%)

of the 101 patients had bilateral cataracts and 50 (70.4%) of these had surgery performed on both eyes, separately, during the study period.



**Figure 1.** Age and sex distribution of patients

Forty-two patients (41.6%) presented within six months of the onset of symptoms, while 51 patients (50.5%) presented after a year. In 32 of the patients (31.7%), the cataracts were present at birth.

Twenty-four of the 101 patients (23.8%) had associated systemic diseases including congenital heart defects, deafness, microcephaly and cerebral palsy, among others.

With respect to clinical diagnosis, there were 84 congenital cataracts, while 38 were developmental, and 21 were secondary to trauma (table 1).

**Table 1.** Type of cataract

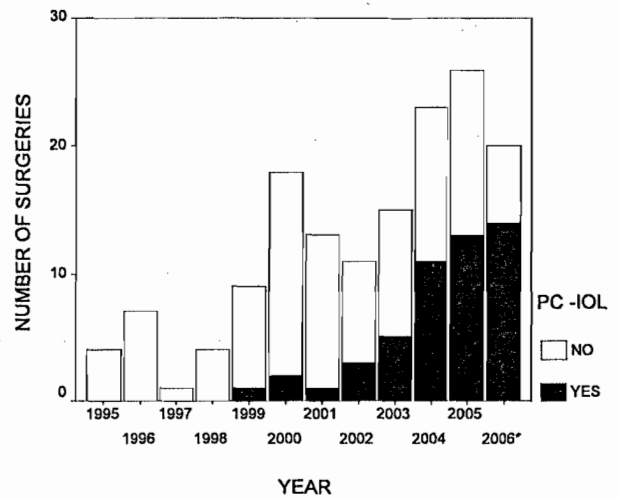
Diagnosis	Number of Eyes	Percentage
Congenital	84	55.6%
Developmental	38	25.2%
Trauma	21	13.9%
Uveitic	3	2.0%
Complicated	3	2.0%
Diabetic	2	1.3%
<b>TOTAL</b>	<b>151</b>	<b>100%</b>

Thirty-four (40.5%) of the congenital cataracts were presumed to be secondary to intrauterine rubella infection (congenital rubella syndrome). This was based on the associated occurrence of congenital heart defects, deafness and mental retardation as well as microphthalmos and pigmentary retinopathy in these patients.

Eighty-nine (58.9%) of the eyes had an associated ocular pathology. Nystagmus was present in 48 eyes (31.8%); strabismus in 30 eyes (19.9%); microphthalmos in 16 eyes (10.6%) and persistent hyperplastic primary

vitreous was found in two eyes (1.3%).

Ninety-eight eyes (64.9%) had extracapsular cataract extraction without intraocular lens implant (ECCE); 50 eyes (33.1%) had extracapsular cataract extraction with posterior chamber intraocular lens implant (ECCE+PCIOL); two eyes (same patient) had needling and aspiration (1998); while one eye had vectis extraction for a subluxated lens. Primary capsulotomy was performed on 34 eyes (22.5%) by incising the posterior capsule with a cystotome. Figure 2 shows the distribution of the number of surgeries performed each year with the use of PCIOL compared with those without an implant. Only 12 (7.9%) eyes had surgery within four weeks of presentation; most of them, 97 eyes (64.2%) had surgery between 4 weeks and six months after presentation, while 42 eyes (27.8%) had their operations delayed for more than six months after presentation.



\* 2006 = January to June

**Figure 2.** Number of surgeries performed per year

Intraoperative complications occurred in 34 eyes (22.5%), the commonest being posterior capsule rupture in 21 eyes (13.9%). Vitreous loss occurred in 19 eyes (12.6%), hyphaema in 4 eyes (2.6%) and retained soft lens matter in 2 eyes (1.3%). Post-operative complications were observed in 119 eyes (78.8%) (table 2). Objective visual acuity measurements were obtained in 90 eyes (59.6%); subjective methods were employed in the remaining eyes, mainly as a result of lack of appropriate methods of assessing vision for infants and toddlers as well as mentally retarded children.

The pre-operative visual acuities are shown in table 3, while the final post-operative visual acuities are shown in table 4. Thirty-five eyes (38.9%) of those with objective visual acuity had a visual outcome of  $\geq 6/18$ , while 55 eyes (61.1%) had a post-operative visual acuity of  $\leq 6/24$ . Refraction was performed for 65 eyes (43.3%). Seventy-six eyes (50.3%) had optical rehabilitation with

the use of aphakic spectacles while four eyes wore contact lenses.

**Table 2. Post-operative complications**

Post-operative complication	Number	Percentage
Posterior capsule opacity	62 eyes	41.1%
Retained lens cortex	48 eyes	31.8%
Transient corneal oedema	38 eyes	25.2%
Fibrinous uveitis	20 eyes	13.2%
Posterior synechiae	15 eyes	9.9%
Elevated intraocular pressure	9 eyes	6.0%
Hyphaema	6 eyes	3.8%
Wound dehiscence	6 eyes	3.8%

Note: Others: endophthalmitis (2 eyes), cystoid macular oedema (1 eye), IOL dislocation (1 eye)

**Table 3. Pre-operative visual acuity**

Visual Acuity	Number of Eyes	Percentage
> 6/18	2	1.3%
6/24 - 6/60	18	11.9%
CF - LP	58	38.4%
Follows / Fixates Light	65	43.1%
Does Not Follow/ Fixate	8	5.3%
TOTAL	151	100%

CF= Counting Fingers; LP =Light perception

**Table 4. Final post-operative visual acuity**

Visual Acuity	Number of Eyes	Percentage
> 6/18	35	38.9%
6/24 - 6/60	29	32.2%
CF - LP	26	28.9%
TOTAL*	90	100%

CF= Counting Fingers; LP =Light perception

\*61 eyes (40.4%) did not have an objective post-operative visual acuity assessment as at last follow up visit.

Follow-up range was 0 - 6.5 years and 57.4% of patients were followed up for at least three months.

Among the patients with congenital cataracts, 2 of the 19 eyes (10.5%) that had an objective assessment of post-operative visual acuity, had a visual outcome of  $\geq 6/18$ . Table 5 shows the visual outcome in the different types of cataract studied.

Further analysis showed that good visual outcome ( $\geq 6/18$ ) was significantly associated with increasing age ( $p = 0.007$  using Pearson chi-square test) and the use of the PC IOL implant ( $p = 0.005$  using Fisher's exact test; odds ratio= 2.1, 95% confidence interval = 1.2- 3.6).

Poor visual outcome ( $\leq 6/24$ ) was significantly associated with: (a) onset of cataract at birth ( $p = 0.001$  using Fisher's Exact test; Odds ratio= 1.8. 95% Confidence Interval= 1.5-2.2); (b) the presence of other ocular pathology ( $p = 0.03$  using Fisher's exact test; odds ratio = 1.5, 95% confidence interval= 1.1- 2.2); and ©

longer period between presentation and surgery ( $p = 0.02$  using Pearson Chi squared test).

**Table 5. Visual outcome in different types of cataract**

Type of Cataract	Eyes with Objective Assessment	Eyes with a Visual Outcome of $\geq 6/18$	Percentage
Congenital	25	4	16.0%
Developmental	37	17	45.9%
Traumatic	20	12	60.0%
Diabetic	2	2	100%
Uveitic	3	0	0%
Complicated	3	0	0%

Visual outcome was not significantly associated with duration of symptoms ( $p = 0.2$ ); occurrence of vitreous loss at surgery ( $p = 0.6$ ); occurrence of post-operative complications ( $p = 0.5$ ); use of primary capsulotomy ( $p = 0.7$ ); and development of posterior capsule opacification ( $p = 0.6$ ). These p-values were obtained with the use of Pearson chi square test.

**DISCUSSION**

Blindness in children remains the second leading cause of blind person years worldwide.<sup>12</sup> The prevalence of childhood blindness in Africa is approximately 10 times higher than in the industrialized nations.<sup>13</sup> Thus, paediatric cataract blindness is a huge burden in a country like Nigeria.

The outcomes of paediatric cataract surgery have traditionally been poor in many developing countries when compared with results from developed countries<sup>12</sup> because of the non availability of advanced technology. For example, in the study setting - Ibadan, Nigeria - there is no vitrectomy machine and the use of intraocular lenses only became popular in adults in the early 90s, and in children older than two years in the late 90s.

In this study, congenital cataracts were the commonest type of cataract, as has been reported by previous studies.<sup>25</sup> Traumatic cataracts were also fairly common. This is possibly due to the fact that children are more prone to trauma especially while at play.<sup>26</sup> We were unable to determine the specific aetiology in many of the patients with congenital and developmental cataracts.

Rubella-associated cataracts were often presumed based on the presence of other systemic features, such as heart defects and deafness as well as associated microphthalmos and pigmentary retinopathy, since laboratory confirmation was not available.

The majority (70%) of the patients in this study had bilateral cataracts but only 70% of these had surgery performed on both eyes; this may be due to lack of funds to pay for surgery in both eyes or poor acceptance of surgical outcome by care-givers. There is a definite risk

of amblyopia of the unoperated eye in patients in whom surgery to the other eye is delayed.

Late presentation was a problem as about half (50.5%) of the patients had symptoms for more than one year before presentation. This may have been due to a lack of awareness about the need for early surgery, or the fear of surgery.

Another notable problem was the fact that most patients (>90%) had a delay of at least 6 months between presentation and surgery; this may be due to financial constraints and institutional factors, such as industrial action, and lack of theatre space, which often results in postponement and rescheduling of surgery.

The type of surgery usually performed was ECCE but, it is noteworthy that the use of IOL implants has gradually increased since the year 2000 (figure 2). This is likely as a result of improved surgical skills, as intraocular lens implantation became popular in adults.

### PREOPERATIVE COMPLICATIONS

The pattern of post-operative complications is similar to previous reports.<sup>12,24</sup> The most common complication was posterior capsule opacity (PCO), occurring in 41.1%. Posterior capsule opacity is considered almost universal if the posterior capsule is left intact<sup>27</sup> (see table 3). In our study, only 22.5% had primary management of the posterior capsule. Other studies rate the incidence of PCO at 14–100%.<sup>28</sup> There is a possibility of underestimation in this study because of the poor follow up in our patients. A previous study has reported on the poor follow up observed in paediatric eye clinic patients in our environment.<sup>29</sup> A recently acquired YAG laser is now being used at the eye clinic at UCH to treat PCO.

Raised intraocular pressure is another serious complication which may follow cataract surgery in children. Various studies place its incidence between 0 and 30%.<sup>24</sup> Our study reports 6%. The onset of glaucoma usually occurs 4–6 years post-operatively, however, poor follow up may result in an underestimation. Coupled with this is the fact that intraocular pressure is difficult to measure routinely in children.

Generally, visual outcome appears fair and compares fairly well with previous reports from developing countries; 38.9% (table 4) of all the patients with objective visual acuity assessment in this study had a good visual outcome compared to 40.5% in Nepal<sup>12</sup> and 44.0% in East Africa.<sup>13</sup>

However, visual outcome was better in traumatic and developmental cataracts than in congenital cataracts (table 5). This may be the case because the traumatic and developmental cataracts were found in older patients who had developed fairly good vision prior to the onset of symptoms. This may also explain our finding that older age is associated with a good visual outcome.

In addition, good visual outcome was significantly associated with PC IOL implantation. This finding

simply underscores the fact that intraocular lens implants are superior to spectacles in the correction of aphakia.

A longer delay before surgery; presence of cataract at birth and associated ocular disease had a negative influence on visual outcome. These findings also buttress similar observations from previous studies.<sup>24</sup>

The limitations of this study include missing and incomplete records; lack of appropriate visual acuity testing materials especially for infants and toddlers; and poor follow up.

### CONCLUSION

The management of childhood cataract is an important and often rewarding experience. Surgery is, however, only the first step in a long process of follow up.

Visual recovery of children undergoing cataract surgery in Ibadan is encouraging and the visual outcome is likely to improve with better proficiency in IOL implant surgery.

Availability of the YAG laser will also help to improve visual outcome as it reduces incidence of poor vision due to PCO.

Public health enlightenment campaigns are necessary to increase public awareness about childhood cataract in order to encourage earlier presentation and consent to surgery.

Also, because of the relatively high number of presumed rubella cataracts found in this study, the inclusion of rubella vaccination in the National Programme on Immunization (NPI) schedule is imperative to reduce the incidence of rubella cataracts. In addition, the establishment of well-equipped and well-staffed paediatric ophthalmology centres would be beneficial in improving visual outcome and would help to achieve the goals of the WHO 'Vision 2020: The Right to Sight' initiative.

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