



## Original Article

# Comparison of Visual Outcomes in Children Before and After Cataract Surgery with Intra Ocular Lens (IOL) Implant.

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**Purpose:** To compare the visual functions (Visual acuity, contrast sensitivity, color vision, visual field) in children (from 7 to 17 years old) before and after cataract surgery with intra ocular lens (IOL) implantation and also to find out the particular visual function which improves the best after cataract surgery.

**Method:** A descriptive case series study was conducted among children (from 7 to 17 years old) having cataract to compare visual outcomes (Visual acuity, contrast sensitivity, colour vision, visual field). A total 43 eye of 43 patients presented in Department of Ophthalmology Mayo Hospital Lahore were examined before and after cataract surgery with IOL implant. Visual acuity, contrast sensitivity, color vision and visual field were examined by using Trial frame, Occluder, Ophthalmoscope, Distance VA charts e.g. Lea symbols and Log MAR chart, Farnsworth's Dichotomous D-15 test, Pelli-Robson chart and Torch light/ any toy.

**Results:** Visual acuity was graded as poor (CF+ to 6/36), fair (6/24 to 6/12) and good (6/9 to 6/5). After surgery maximum patients 29(67.4%) out of 43 (n=43) had improved visual acuity. Contrast sensitivity was graded as poor, average and good. After surgery thirty 30(69.8%) patients out of 43(n=43) had improved contrast sensitivity. Paired sample correlations test showed statistically significant improvement in visual acuity and contrast sensitivity ( $p \leq 0.05$ ). Color vision and visual field showed no significant improvement.

**Conclusion:** Visual acuity and contrast sensitivity were significantly improved after surgery with IOL implantation. Importantly visual acuity was the most effective visual function which was improved after cataract surgery. Color vision and visual field showed no significant improvement.

**Keywords:** IOL, Cataract, visual acuity, contrast sensitivity, colour vision, visual field.



### Introduction:

Damage to vision at an early age has lifelong implications for children's lives. It can obstruct with education, hinder the development of personality and deprives an individual career, which increases the socio-economic burden of family and community. Blindness costs lots of money in the form of lost productivity, care for the blind, their rehabilitation and special education. About one third of them performed blindness in childhood. Unfortunately, half of them lost vision because they were not operated for cataract. Thus, pediatric cataracts are an important contribution to the reduction of visual acuity in childhood. Cataract is define as opacification of crystalline lens inside the eye and it plays major role in decreasing the vision but it is most treatable and avoidable cause of universal visual impairment. One of the most common cataract surgeries is intra ocular lens (IOL) implantation and is the most effective surgical procedure in medical field. Causes of cataract in children include:

- A genetic fault present at birth (which comes from the child's parents) that causes the lens to develop abnormally.
- Down's syndrome
- Infections from mother during pregnancy
- Trauma (due to trauma to eyes after birth)
- Medications (less common)
- Genetic predisposition is also thought to be one of the causes of cataract.

Visual functions included visual acuity, contrast sensitivity; color vision and visual fields are important for most advantageous orientation in functional and social life and has an effect on physical and expressive well-being. Visual impairment, therefore, leads to restrictions in all aspects of daily living including quality of life. Contrast sensitivity (CS) is one reliable measure for visual performance after implantation of an intraocular lens (IOL). The measurement of the visual field decay rate is an important step to suitable decision making to preserve vision in cataract patients on the short-term effects of cataract extraction. The long-term outcome of paediatric cataract surgery depends on following different factors:

- Age (at the first level of detection of cataract)
- Age (at the level of surgery)
- Associated ocular anomalies
- Development of aphakic glaucom

A variety of factors determines the likelihood of a successful functional and morphological outcome after paediatric cataract surgery. Currently intra ocular lens implantation is best method for the treatment of cataracts. It shows good visual outcomes at near, distant and intermediate distances. With the use of multifocal IOL we can make patient spectacle independent and increase overall patient

satisfaction.

Previous studies show that (IOL) intra ocular lens provides an effective restitution of the distance, intermediate, and near visual function, allowing patients to be completely free of need to wear corrective lenses and providing high levels of patient liking. And show great improvement in visual outcomes.

This study also shows that surgery is desirable only if the cataracts are causing problems and usually results in an improved visual outcomes and quality of life of the patients.

### Materials and Methods:

We studied 43 cataractous eyes of the patients at Department of Ophthalmology King Edward Medical University Mayo Hospital Lahore. It was a descriptive case series study. Patient's visual acuity, contrast sensitivity, color vision and visual field were recorded before and after cataract surgery through a predesigned performa by using Trial frame, Occluder, Ophthalmoscope, and Distance VA charts e.g. Lea symbols and Log MAR chart, Farnsworth's Dichotomous D-15 test, Pelli-Robson chart and Torch light/ any toy. Patients of age 7 years to 17 years with cataract were planned to undergo cataract surgery with intraocular lens implantation. Inclusion criteria was cooperative patients, both male and female, congenital and acquired cataract and patients having Visual acuity at least up to counting finger except patients with any other ocular surgery.

Patients' personal profile including name, age and sex were recorded. In ophthalmological record, visual acuity, contrast sensitivity, color vision and visual fields were noted before surgery and irrigation-aspiration/ phacoemulsification with intraocular lens (IOL) implantation was then done. We again noted the ophthalmological record of visual acuity, contrast sensitivity; color vision and visual fields at follow up.

Biomicroscopy with a slit lamp was done to check the other ocular pathologies. Funduscopy was done with ophthalmoscope for the examination of cataract. We included all types of cataracts.

Data was analyzed by making tables and graphs in SPSS 23 software and calculated frequencies and percentages of different variables through it. Paired sample correlation test was used for the comparison of qualitative variables. Quantitative variables were compared by means, SD (standard deviation) and Std. Error of Mean.

### Results:

The total frequency and percentage of patients in which 20(46.5%) patients were male and 23(53.5%) patients were female. Visual acuity was graded as poor (CF+to6/36), fair (6/24to6/12) and good (6/9to6/5). Nineteen 19(44.2%) patients out of (n=43) had poor (CF+to6/36) visual acuity before surgery. Twenty-four 24(55.8%) patients out of 43(n=43) had fair (CF+to6/36) visual acuity before surgery. And after surgery 29(67.4%) out of 43 (n=43) patients had improved vision to good (6/9to6/5). And p-value with paired sample correlations

test is 0.000 which shows that visual acuity is a significant factor.

Contrast sensitivity was graded as poor, average and good. Twenty-three 23(53.5%) patients with poor contrast sensitivity before surgery had improved contrast sensitivity to average. Twenty 20(46.5%) patients with average contrast sensitivity before surgery had improved contrast sensitivity to good. Total thirty 30(69.8%) patients out of 43(n=43) had improved contrast sensitivity to good and this study shows that most patients had good contrast sensitivity after cataract surgery. And p-value with paired sample correlations test is 0.001 this show that change in contrast sensitivity before and after surgery was significant.

Color vision was graded as present and colour-blind. Out of three 3(7.0%) colour-blind patients before surgery only 1(2.3%) was not improved. p value with paired sample correlations test is 0.000.

Visual field was graded as No defect and defect. Fifteen 15(34.9%) patients out of 43 (n=43) with visual field defects before surgery had improved to No defect after surgery. Only 1(2.3%) patient had visual field defects after surgery. p-value with paired sample correlations test is 0.175.

**Table 1:**

Visual Acuity Before Cataract Surgery			Visual Acuity After Cataract Surgery		
	Frequency	Percent		Frequency	Percent
CF+to6/36(poor)	19	44.2	CF+to6/36 (poor)	3	7
6/24to6/12 (fair)	24	55.8	6/24to6/12 (fair)	11	25.6
			6/9to6/5 (good)	29	67.4
Total	43	100	Total	43	100

Above table show the visual acuity before and after cataract surgery. Most of the patients had good visual acuity. p value paired sample correlation test is .000

**Table 2:**

Contrast Sensitivity Before Cataract Surgery			Contrast Sensitivity After Cataract Surgery		
	Frequency	Percent		Frequency	Percent
Good	0	0	Good	30	69.8
Poor	23	53.5	Poor	2	4.7
Average	20	46.5	average	11	25.6
Total	43	100.0	Total	43	100.0

Above table show the contrast sensitivity before and after cataract surgery. Contrast sensitivity was graded as good, poor and average. Most of the patients had good contrast sensitivity after surgery. And p value paired sample correlation test is .000

**Table 3:**

Color vision before cataract surgery			Color vision after cataract surgery		
	Frequency	Percent		Frequency	Percent
Present	40	93.0	Present	42	97.7
colour-blind	3	7.0	colour-blind	1	2.3
Total	43	100.0	Total	43	100.0

Above tables show the color vision before and after cataract surgery. And show no significant improvement in color vision. And p value paired sample correlation test is .001

**Table 4:**

Visual Field Before Cataract Surgery			Visual Field After Cataract Surgery		
	Frequency	Percent		Frequency	Percent
No defects	28	65.1	No defects	42	97.7
Defects	15	34.9	Defects	1	2.3
Total	43	100.0	Total	43	100.0

Above table show the visual field before and after cataract surgery. Most of the patients had no field defects after surgery. And p value paired sample correlation test is .175

### Discussion:

As we know cataract slowly leads to decrease in vision, reduced contrast sensitivity, faded colours halos around light, trouble with bright lights and difficulty seeing at night. And the visual outcomes discussed here are visual acuity, contrast sensitivity, color vision and visual field. Visual acuity is resolving power of the eye which commonly refers to the clarity of vision. It is a parameter that is normally used to assess overall vision. *Contrast sensitivity* is a proportion of the capacity to recognize luminance of various dimensions in a static picture. *Contrast sensitivity* shifts between people, getting a most extreme at around 20 years old, and at angular frequencies of about 2– 5 cycles for each degree. Furthermore, it can decrease with age and furthermore because of different factors, for example, cataracts and diabetic retinopathy.

Color vision is the capacity of organism to recognize objects dependent on the wavelengths (or frequencies) of the light they reflect, radiate, or transmit.

The visual field is the spatial array of visual sensations. The normal (monocular) human visual field extends to approximately 60 degrees nasally, 107 degrees temporally and approximately 70 degrees superiorly and 80 inferiorly the horizontal meridian.

Cataract is thought to be the leading cause of blindness and visual impairment worldwide. And it is most treatable and avoidable cause of universal visual impairment. Damage to vision at an early age has long-lasting implications for children's lives. It can interfere with education, hinder the development of personality and deprives an individual career.



Visual impairment has adverse effects on one's health like difficulty in performing routine life activities, mental health problems, physical malfunction and poor health related quality of life. Cataract is one of the most important causes of treatable blindness in developing countries and is thought to be a top cause of blindness in children under age less than 15 years.

Although the World Health Organization (WHO) has tried to control the blindness through its Vision 2020 but cataract still remains the major cause of blindness among children. According to World Health Organization (WHO) there are 1.4 million children who are suffering from blindness worldwide and the major cause of this blindness is cataract.

Cataract also affects other visual functions like contrast sensitivity, color vision and visual fields. Reduced contrast sensitivity causes difficulty in seeing curtains, currency, food on plate, borders or edges and stairs. Color vision defects can cause difficulty in recognize primary colours. Visual field defects reduce the field of view of patient and cause difficulty in seeing side objects.

Previous studies show that (IOL) intra ocular lens provides an effective restitution of the distance, intermediate, and near visual function, allowing patients to be completely free of need to wear corrective lenses and providing high levels of patient liking and show great improvement in visual outcomes.

This study includes a total of 43 patients. On comparing the visual functions (for example, visual acuity, contrast sensitivity, color vision and visual field) before and after cataract surgery with IOL implant visual functions were improved. There was a significant improvement in visual acuity after surgery. Most of the patients had good visual acuity almost 67.45% out of 100% (n=43). Most of the patients had good contrast sensitivity after surgery. There significant increase in visual fields which were associated with traumatic cataract. Color vision shown no significant improvement this might be due to small sample size or some genetic defects.

This study also concludes that surgery is desirable only if the cataracts are causing problems and usually results in an improved visual outcomes and quality of life of the patient.

#### Conclusion:

Visual acuity and contrast sensitivity were significantly improved after surgery with IOL implantation. Importantly visual acuity was the most effective visual function which was improved after cataract surgery. Color vision and visual field showed no significant improvement. This might be due to small sample size or some other cause and recommends further studies on color vision and visual fields in cataract. This study also concludes that good visual outcomes were associated with early detection and treatment of cataract in children.

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