

# Refractive outcomes of phacoaspiration in paediatric cataract: A retrospective cohort study

## Abstract

**Background:** Cataract is the mechanism of opacification of the lens of the eye, which is mostly seen in adults as a result of old age, associated comorbid conditions and systemic diseases. Globally, around 70 million blind-person-years are due to childhood blindness, out of which around 14%, i.e. 10 million blind-person-years are because of childhood cataract<sup>3</sup>. India has a huge burden of approximately 280,000–320,000 children with impaired vision, which leads to the loss of millions of dollars. Hence we conducted a hospital-based retrospective study on the presentation patterns, visual impairment and surgical outcomes of patients suffering from pediatric cataracts in central India. **Aim:** To determine the safety and visual outcomes for pediatric cataracts done under RBSK in Ratan Jyoti Netralaya Ophthalmic Institute and Research Centre Gwalior (M.P.). **Objective:** To determine the safety and visual outcomes for pediatric cataracts done under RBSK at an Ophthalmic Research Institute in a developing country. **Methods:** This retrospective cohort study was conducted on patients diagnosed with congenital and developmental cataracts under the age of 18 years presenting to the hospital and undergoing phacoaspiration surgery at xxx institute in Central India. For each patient, the Best Corrected Visual Acuity (BCVA) using Snellen's Chart and age at presentation was assessed. Clinical presentation, management and surgical outcomes were recorded. **Results:** The postoperative vision of 50 eyes was analyzed (Figure 2). 4 (8%) eyes had vision >6/12 (excellent), 7 (14%) eyes had vision between 6/24 and 6/12 (good), 39 (78%) of the eyes had vision between 6/60 and 6/36 (satisfactory). **Conclusions:** Our study revealed that cataract extraction with IOLs implantation done with anterior vitrectomy+primary posterior capsulotomy is the procedure of choice for the management of pediatric cataract. Cataracts associated with anterior segment abnormalities have a poor postoperative outcome. Early diagnosis and prompt surgical intervention are extremely important in the management of pediatric cataract, as also adequate visual rehabilitation in the form of spectacles with both distance and near correction.

**Keywords:** Paediatric • Cataract • childhood • blindness • India

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## Introduction

Cataract is the mechanism of opacification of the lens of the eye, which is mostly seen in adults as a result of old age, associated comorbid conditions and systemic diseases [1]. At present, the most important cause of treatable childhood blindness is paediatric cataracts. The World Health Organization's (WHO) initiative for the global elimination of blindness has targeted avoidable causes and has given utmost priority to childhood blindness [2]. It is extremely necessary to identify and manage cataracts in children because they can lead to tremendous economic, emotional and social burdens to the family, child, and society. Most of these cases are

diagnosed on routine screening in OPDs, whereas some are diagnosed after parents noticed strabismus or leukocoria [3].

Globally, around 70 million blind-person-years are due to childhood blindness, out of which around 14%, i.e. 10 million blind-person-years are because of childhood cataract<sup>3</sup>. India has a huge burden of approximately 280,000–320,000 children with impaired vision, which leads to the loss of millions of dollars [4].

Therefore, a thorough understanding of the critical period of the development of vision is extremely crucial to initiate early diagnosis and treatment

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within the first 3 months of life, which can even be as early as the first 6 weeks from birth.

Hence we conducted a hospital-based retrospective study on the presentation patterns, visual impairment and surgical outcomes of patients suffering from pediatric cataracts in central India.

## Materials and Methods

The target population enrolled were children below 18 years of age operated at the hospital from 2016 to February 2020. Informed consent was obtained from the parents of all patients participating in the study and it has been approved by the institutional Ethics Committee of the institute.

This retrospective cohort study was conducted on patients diagnosed with congenital and developmental cataracts under the age of 18 years presenting to the hospital and undergoing phacoaspiration surgery at xxx institute in Central India. For each patient, the Best Corrected Visual Acuity (BCVA) using Snellen's Chart and age at presentation was assessed. Clinical presentation, management and surgical outcomes were recorded.

### Inclusion criteria

- All congenital and developmental cataract patients identified under RBSK undergoing surgery at RJN below 18 years of age.
- Minimum follow-up of 3 months duration.

### Exclusion criteria

- Traumatic cataract
- Steroid-induced cataract
- Patients having retinal disorders and (ROP babies requiring treatment)

### Statistical Analysis

Data were entered into SPSS Software. The analysis was done in SPSS version 16.0 in the windows operating system. Measures of descriptive analysis namely percentage, mean and standard deviation were utilised to depict the clinical parameters in the research Pro-forma. All statistical tests were examined with a 5% level of significance of  $P \leq 0.05$ .

### Outcome Measures

Visual acuity postoperatively and on follows for a minimum of up to 3 months was the main method of measuring the outcome of surgery, along with the status of the other eye and the development of any squint has to be ruled out.

The parameters assessed at follow-up were Best corrected visual acuity, Intra-Ocular Pressure, complications preoperatively and postoperatively and other notable findings if any.

## Results

The study included 50 eyes and 33 cataracts from

January 2016 to February 2020. 34 eyes of 17 patients had bilateral cataracts and 16 eyes of 16 patients had a cataract in a single eye.

The follow-up days were postop day 1, day 7 and 5-6 weeks after surgery. Residual ametropia was corrected with occlusion therapy and spectacle correction, which was initiated soon after surgery. A typical occlusion therapy regimen for infants lasted 6 to 8 hrs every day and for late-onset, it was done for 2 to 6 hours a day in single-eye cataracts, with adjustment according to the degree of amblyopia in cases with cataracts in both eyes. Table 1 shows the distribution of patients according to age.

Preoperative visual acuity was recorded by Snellen's chart and fixation pattern. 46 (92%) of the eyes had vision less than 6/60 (which is defined as visual acuity less than 6/60 or poor fixation), 3(6%)of the eyes had vision 6/60-6/18, while in one (2%) eye visual acuity cannot be recorded as the child was uncooperative (uncooperative/<6/60)(Table 2). In the greatest proportion of cases, nearly 92 % had a preoperative visual acuity <6/60 (Figure 1).

Out of the 50 eyes, 4 (8%) eyes were left aphakic in 2 children with bilateral congenital cataracts less than 1 year of age. The postoperative vision of 50 eyes was analyzed (Figure 2). 4 (8%) eyes had vision >6/12 (excellent), 7 (14%) eyes had vision between 6/24 and 6/12 (good), 39 (78%) of the eyes had vision

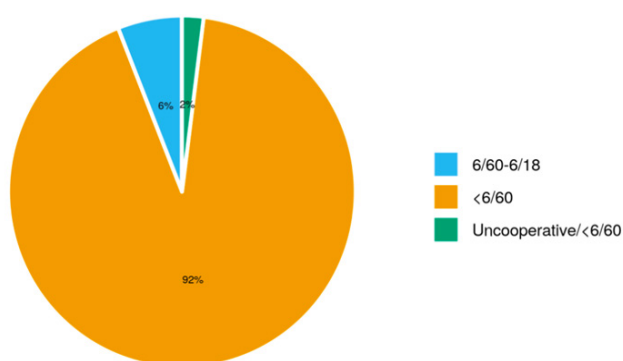
**Table 1: Age-wise distribution of patients**

Age Group (yrs)	Number (%)
<2	5 (15.1)
2-10	16 (48.4)
>10	16 (48.4)

**Table 2: Distribution of the participants in terms of preoperative visual acuity (n=50)**

Preoperative Visual Acuity	Frequency	Percentage
6/60-6/18	3	6.00%
<6/60	46	92.00%
Uncooperative/<6/60	1	2.00%
Total	50	100.00%

**Distribution of Preoperative Visual Acuity**



**Figure 1: Distribution of preoperative visual acuity**

between 6/60 and 6/36 (satisfactory) (Table 3).

The follow-up duration with postoperative visual acuity (>6/12) ranged from 11 days–473 days. The follow-up duration with postoperative visual acuity (6/24-6/12) ranged from 1 day–413 days. The follow-up duration with postoperative visual acuity (6/60-6/36) ranged from 1 day–238 days (Table 4) (Figure 3).

Out of 46 (92%) eyes with preoperative visual acuity <6/60, 3(6.5%) eyes had postoperative visual acuity >6/12 (excellent), 4 (8.7%) eyes had visual acuity 6/24-6/12(good) and 39(84.8%) eyes had visual acuity 6/60- 6/36 (satisfactory).

3(6%) eyes with preoperative visual acuity 6/60-6/18 had postoperative visual acuity 6/24-6/12(good). 1 (2%) eye with preoperative visual acuity unco-operative/<6/60 had postoperative visual acuity >6/12(excellent) (Figure 4).

There was a significant difference between various groups concerning the distribution of visual acuity

in the postoperative period ( $X^2=31.250, p\leq 0.001$ ) (Table 5).

Eyes with preoperative visual acuity: 6/60-6/18 had the largest proportion of postoperative visual acuity 6/24-6/12(Good). Eyes with preoperative visual acuity <6/60 had the largest proportion of postoperative visual acuity 6/60-6/36 (Satisfactory).

### Discussion

According to the World Health Organization (WHO), every minute, a child goes blind somewhere in the world<sup>2</sup>. In 1992 they estimated that there are around 15 lakh children with SVI or severe visual impairment in the world. The prevalence of childhood cataracts is approximately 1 to 15 per 10,000 children.

In our study, 50 eyes of 33 patients with cataracts were evaluated concerning the laterality, age at the time of surgery and follow-up duration. It is difficult to compare our study with others because of the difficulty in recording visual acuity in the paediatric age group due to non-cooperation. The imprecision of this acuity assessment is a limitation of our study. It is suggested that younger children may have better results because they may have had less delay between the onset of cataract and surgical treatment, or that they may have worse results because of the onset of cataract at a younger age [5]. The limitations of our data prevent us from definitively resolving this issue. The mean age at surgery was 7.74 years, this is similar to the findings in the study done in Ethiopia (mean of 7.9 years) and other studies in low/middle-income countries [6-8]. However, the age at surgery in our study was higher than a report from developed countries [3]. A study from Kenya also showed a younger age at surgery compared with our study [9]. The age of our patients varied from 4 months to 17 years.

Our study included an almost equal number of males and females. There are 17 male children and 16 female children, there is no gender disparity in

Distribution of Postoperative Visual Acuity

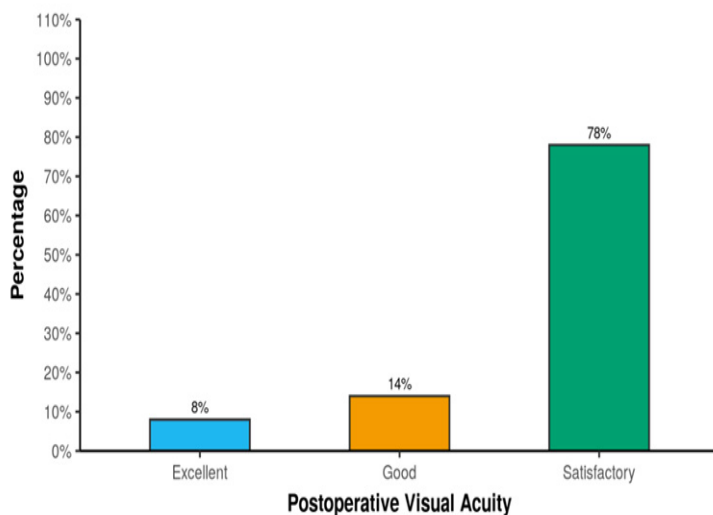


Figure 2: Distribution of postoperative visual acuity

**Table 3: Association between postoperative visual acuity and IOL implantation (n=50).**

IOL Implantation	Postoperative Visual Acuity			Total	Fisher's Exact Test	
	Excellent (>6/12)	Good (6/24-6/12)	Satisfactory (6/60-6/36)		X <sup>2</sup>	P Value
Yes	4 (8.7%)	7 (15.2%)	35 (76.1%)	46 (100.0%)	1.226	1
No	0 (0.0%)	0 (0.0%)	4 (100.0%)	4 (100.0%)		
Total	4 (8.0%)	7 (14.0%)	39 (78.0%)	50 (100.0%)		

**Table 4: Comparison of the 3 subgroups of the variable postoperative visual acuity in terms of follow-up duration (Days) (n=50)**

Follow-up duration (Days)	Postoperative visual acuity			Kruskal Wallis test	
	Excellent (>6/12)	Good (6/36-6/24)	Satisfactory (6//60-6/36)	X <sup>2</sup>	p-value
Mean (SD)	154.25 (215.37)	164.86 (165.59)	57.77 (61.27)	2.693	0.26
Median (IQR)	66.5 (31.25-189.5)	107 (39.5-277)	34 (18.5-75)		
Range	11–473	1-413	1-238		

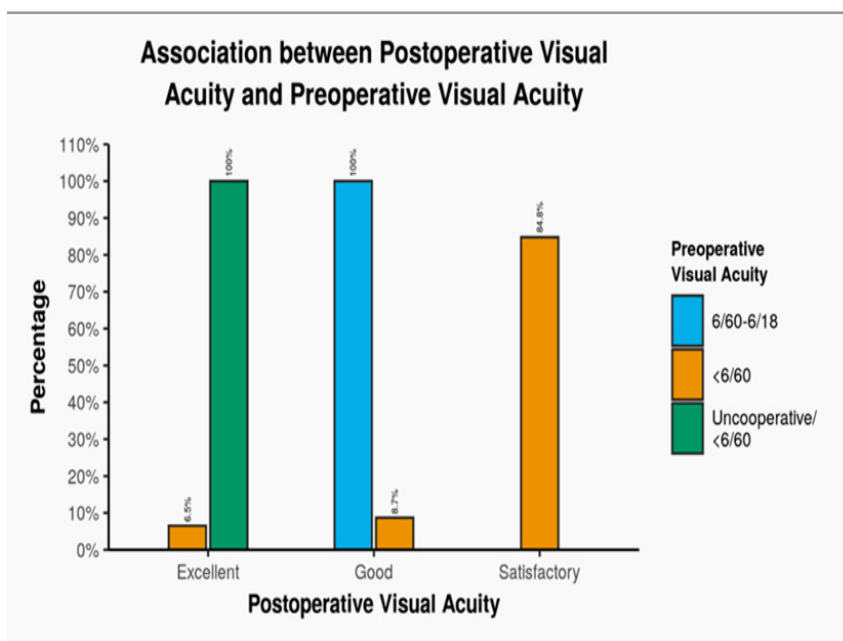


Figure 3: Association between postoperative visual acuity and follow-up duration

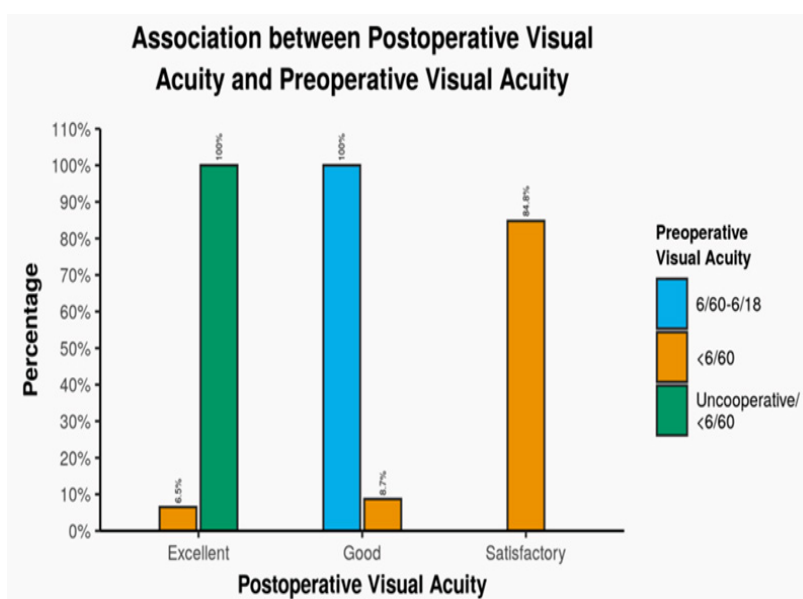


Figure 4: Association between postoperative and preoperative visual acuity

Preoperative Visual Acuity (=50)	Postoperative Visual Acuity			Fisher's exact test		
	Excellent (>6/12)	Good (6/36-6/24)	Satisfactory (6/60-6/36)	Total	X <sup>2</sup>	P Value
6/60-6/18(n=3)	0(0.0%)	3(100.0%)	0(0.0%)	3(100.0%)	31.25	<0.001
<6/60(n=46)	3(6.5%)	4(8.7%)	39(84.8%)	46(100.0%)		
Uncooperative/<6/60(n=1)	1 (100.0%)	0(0.0%)	0(0.0%)	1(100.0%)		
Total	4(8.0%)	7(14.0%)	39(78.0%)	50(100.0%)		

our study. However, a study done by Gogate et al included significantly more males (18) than females (8) [10]. They attributed the reason to less access to eye care facilities for females in India. A study conducted in Nepal by Chaudhary S et al in 2017

found male: female ratio of 1.3:1, 57% were males [11]. Sex had no correlation with visual outcome (p=0.286). Though there is no evidence that the incidence of childhood cataract is more in males, more males were brought for surgery. This may be

because the parents concern for their sons which is common in many parts of developing world including India. Thus pointing towards a gender bias in these two studies as compared to our study.

Our study did not show significant correlation with postoperative final visual outcome in relation to IOL implantation or aphakia ( $P=1.000$ ), this may be because of early correction of aphakia with glasses in aphakic cases and amblyopia therapy. This is consistent with the study done by Chaudhary S et al in Nepal which did not show any significant correlation with postoperative final visual outcome in relation to IOL implantation or aphakia ( $p=0.129$ ) [11].

In a study done by Shah MA et al (2012), Bowman et al [12] (2007), and Hochstrasser et al [13] (1994) has shown that insertion of IOL resulted in significant improvement in visual outcome [11-13]. A study done by Khanna RC et al in south India reported postoperative visual acuity of  $>6/18$  in 39.5% of the patient, Ghodke A et al conducted a study on pediatric cataract in July 2017 and on assessment of visual acuity with Snellen's chart, 17 eyes (36.2%) had best corrected visual acuity better than  $6/18$  after cataract extraction at last visit i.e. at 6 months [5]. Gogate et al [14] reported 42.2% having best corrected visual acuity (BCVA)  $>6/18$ . Postoperatively there was a significant improvement in visual acuity [14].

Management of pediatric cataract poses an important problem with respect to changing refraction, technical aspects of surgery as well as functional outcome [15]. The timing of surgery is crucial for successful optical restoration and good postoperative outcome, especially in case of children [16]. Strict follow up and adequate rehabilitation are necessary for good results. In order to address blindness due to cataract, counselling of parents with active case finding combined with and clear referral pathways are extremely important [17]. Surgery must be undertaken by a paediatric ophthalmologist in a fully equipped unit, with trained and supportive staff. Multiple strategies are most likely to be required to improve follow-up after surgery [18-20].

## Conclusions

Our study revealed that cataract extraction with IOLs implantation done with anterior vitrectomy+ primary posterior capsulotomy is the procedure of choice for the management of pediatric cataract. Cataracts associated with anterior segment abnormalities have a poor postoperative outcome. Early diagnosis and prompt surgical intervention are extremely important in the management of pediatric cataract, as also adequate visual rehabilitation in the form of spectacles with both distance and near correction.

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