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ORIGINAL ARTICLE

VISUAL RECOVERY AFTER SURGICAL TREATMENT IN CHILDREN WITH BILATERAL CONGENITAL CATARACT

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ABSTRACT: PURPOSE: The study is aimed to evaluate the visual outcomes after surgical treatment in older children, aging between 6-12 years, having bilateral congenital cataract. **SETTING:** At a Tertiary Level Government Medical College Hospital. **DESIGN:** Prospective Interventional case series. **RESULTS:** In this study 80 eyes of 40 children are included. They are divided into 3 groups depending on age, group I (6-7 years of age) in which 36 eyes are included, group II (8-9 of age) in which 24 eyes are included, group III (10-12 years of age) in which 20 eyes are included. In this study, in 6-7 years age group the post-operative acuities are > 0.33 in 26 eyes, 0.1-0.25 in 9 eyes and <0.1 in 1 eye. In this age group more number of eyes has improved to > 0.33 LogMar. In this study, 26 eyes in group I, 10 patients in group II, 1 eyes in group III improved to > 0.33 LogMAR. 9 eyes in group I, 12 eyes in group II and 9 eyes in group III had post op VA between 0.1-0.25 LogMAR. 1 eye in group I, 2 in group II, 10 in group III had post op VA <0.1 LogMAR. Eyes with post op vision > 0.33 LogMAR are more in group I. Eyes with post op vision between 0.1-0.25 LogMAR are more in group II. In group III more number of eyes have vision less than 0.1 Log Mar post op. Statistically significant number of eyes have improved to >2 lines in group I($p<0.001$) and group II ($p<0.004$) and less significant number of eyes in group III. **CONCLUSION:** Thus the present study concludes good visual outcomes with lesser age irrespective of pre-operative vision and poor visual outcomes with increasing age. Hence children with bilateral congenital cataract should seek early treatment for better visual outcome.

KEYWORDS: Visual Acuity, LogMAR.

INTRODUCTION: Childhood cataract blindness is one of the major avoidable causes of blindness in both developed and developing countries and it is a priority for VISION 2020: The right to sight initiative.[1] Cataracts are reported to be responsible for approximately 20% of cases of childhood blindness globally.[2-7] In most developed nations, cases of congenital cataracts are treated within a few months of birth and in under developed nations, they often go untreated for several years. Lack of awareness, access and monetary resources deprive them. Their blindness profoundly limits their prospects for education, social integration and eventual employment. The epidemiology of childhood cataract can be group of multiple etiologies defined by age. Of the 1.4 million blind children globally, the number due to lens-related conditions is estimated to 190, 000 (14%), with proportion varying in different countries.[7,8,9]

Congenital cataract causes preventable blindness. However, treatment of congenital cataract poses several unique problems compared to adults. First comes the issue of amblyopia, which is usually reversible up to the age of 8 years. After this, reversibility is very difficult. Thus, earlier cataract surgery and visual rehabilitation if started, the less chances of amblyopia setting in.

Though IOL implantation seems to be the best option, there are inherent problems. One is calculation of IOL power in a growing eye ball. Other problems are early and late post-operative complications like exaggerated Uveal inflammation and PCO formation respectively.

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Over the past decade, various studies have looked at the outcome of bilateral congenital cataract,[10-20] but only a few have looked at the outcome of both congenital and developmental cataracts and most of them were small specific series.[11,12,14,17] In View of the anatomical peculiarities of pediatric cataracts like a series of fibres meets the capsule at the equator[21,22] Cells in the germinative equatorial zone are dividing constantly, newly formed cells are forced into the transitional zone where they elongate and differentiate to form the fiber mass of the lens.[23,24] They undergo fibrous metaplasia and migrate to the posterior capsule to cause PCO. It is usually fibrinous in nature and difficult to treat with YAG laser or surgery. Thus the primary posterior capsulotomy is performed in children to ensure a clear visual axis.

The goal of the present study was to address the issue of visual outcomes after extended early-onset congenital blindness. The specific questions we sought to answer were, what the visual acuity outcomes are following surgery in children with bilateral early-onset cataracts when intervened after 6 (6-12) years of age. Do acuity outcomes correlate with age at treatment?

MATERIALS AND METHODS: In the present study, the Inclusion Criteria is bilateral congenital cataract presenting between 6-12 years of age causing significant visual impairment.100 eyes of 50 children are included with bilateral congenital cataract. The developmental cataracts, traumatic cataracts, complicated cataracts, cataracts with intra operative and post-operative complications are excluded. Children with neuro developmental delay are also excluded.

In this prospective interventional case series, the surgeries were performed between the years October 2012 to June 2014. The cases were done at a tertiary care government medical college hospital. The surgeries were performed by the presenting author and the contributing authors. Before the study was taken up, permission was granted by the institutional ethics committee, informed consents were taken from the patients and attendants. They were divided into 3 groups depending on age, group-I (6-7) years, group–II (8-9) years and group-III (10-12) years. These groups are subdivided into 3 subgroups according to preoperative vision in Log Mar, sub group I (PL+ve-0.08), sub group-II (0.1-0.16), and sub group-III (>0.16). All the eyes underwent complete slit lamp examination, Fundus examination and subjective refraction and in necessary cases B scan was performed to rule out the posterior segment pathology.

In co-operative patients A-Scan biometry was done. Pre anesthetic checkup was done for all cases and were thoroughly prepared pre-operatively with sufficient dilatation of the pupils using 1% atropine eye ointment 3 times a day and all the cases were examined locally as well as systemically. All the eyes underwent SICS with foldable IOL implantation with primary posterior capsulotomy and anterior vitrectomy under general anesthesia. Post-operatively, the children were administered injection Dexamethasone (I.V) immediately after surgery and kept on hourly topical steroid eye drops that are gradually tapered in the next 4-6 weeks. Topical cycloplegics are administered twice daily for two weeks. Oral steroids are started on the 1st postoperative day and tapered over 4-6 weeks. All the surgeries were performed between October 2012 to June 2014 at Sarojini Devi Eye Hospital, Hyderabad. Six (6) eyes had intraoperative complications and 14 eyes had post-operative complications and were excluded from study. Post-operative UCVA & BCVA are recorded at IPOD, at I week, 1month, and 6months post operatively. Amblyopic treatment was instituted for necessary cases.

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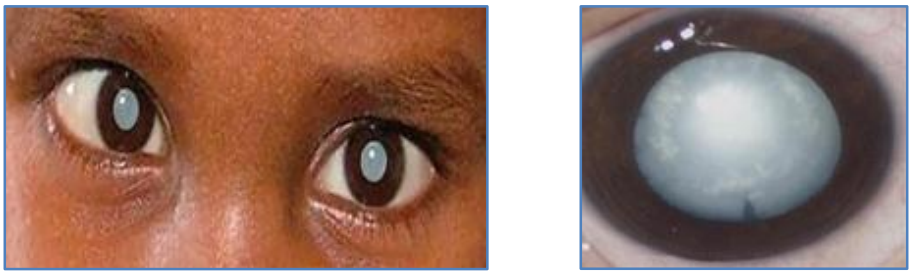
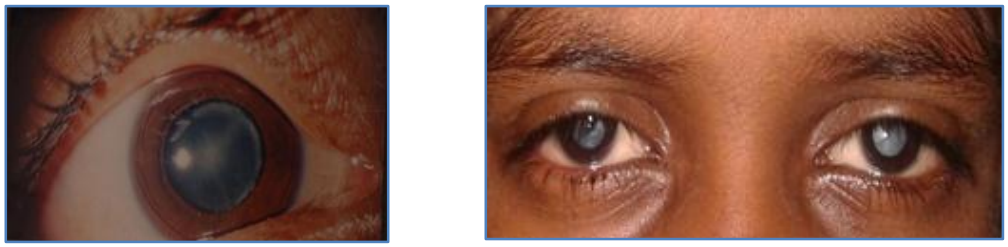
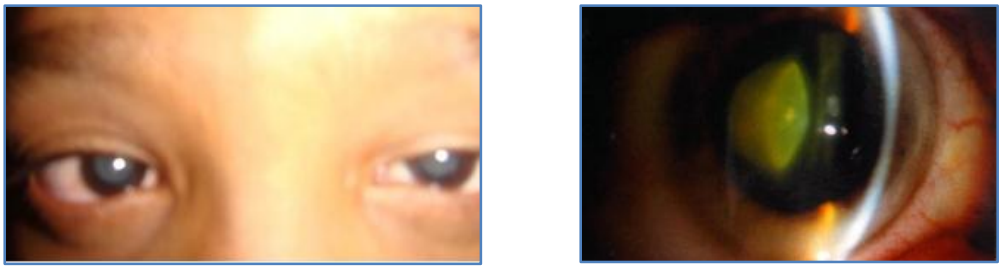
Statistical Analysis: All the data were recorded and presented as mean. Student Paired. Test was used on all continuous data to calculate statistical significant difference between pre-operative and post-operative values in same group. Anova Test is used to calculate the statistical significance between different groups. Thus statistical significance difference is taken when p-value <0.05.



B/L TOTAL CONGENITAL CATARACT



BILATERAL LAMELLAR CONGENITAL CATARACT



B/L CONGENITAL NUCLEAR CATARACT

RESULTS: In this study 80 eyes of 40 children are included. They are divided into 3 groups depending on age, group I (6-7 years of age) in which 36 eyes are included, group II (8-9 of age) in which 24 eyes are included, group III (10-12 years of age) in which 20 eyes are included.

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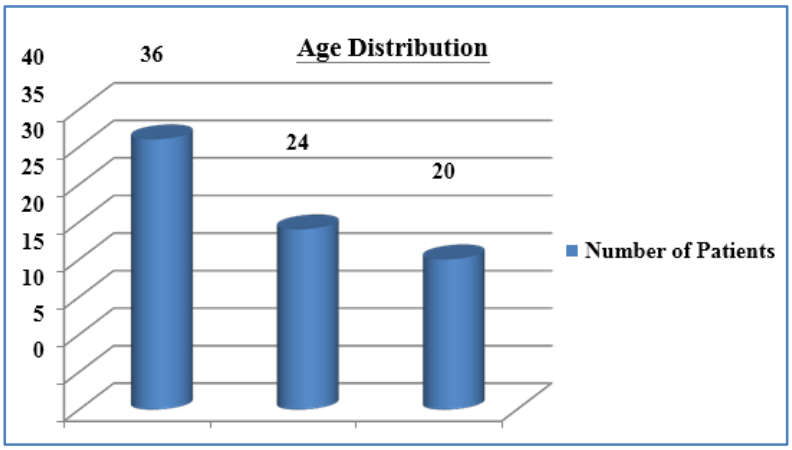

Fig. I- Mean age distribution among groups I, II & III

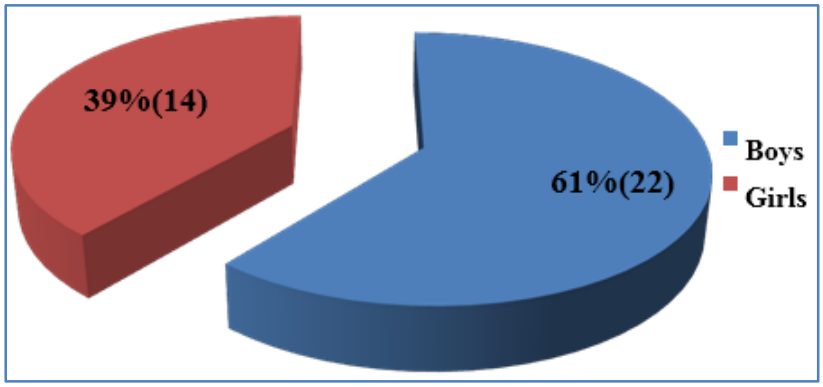

Fig II- Mean sex distribution among group I (6-7 years)

Sex Distribution among 8-9 yrs;

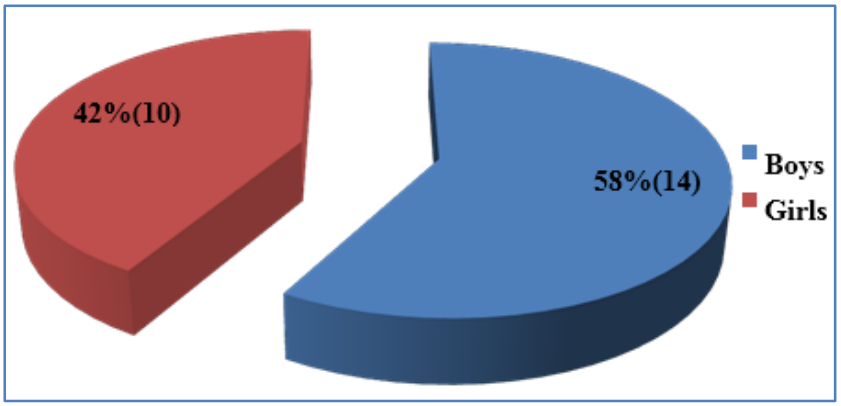

Fig. III: Mean sex distribution among group II (8 - 9yrs)

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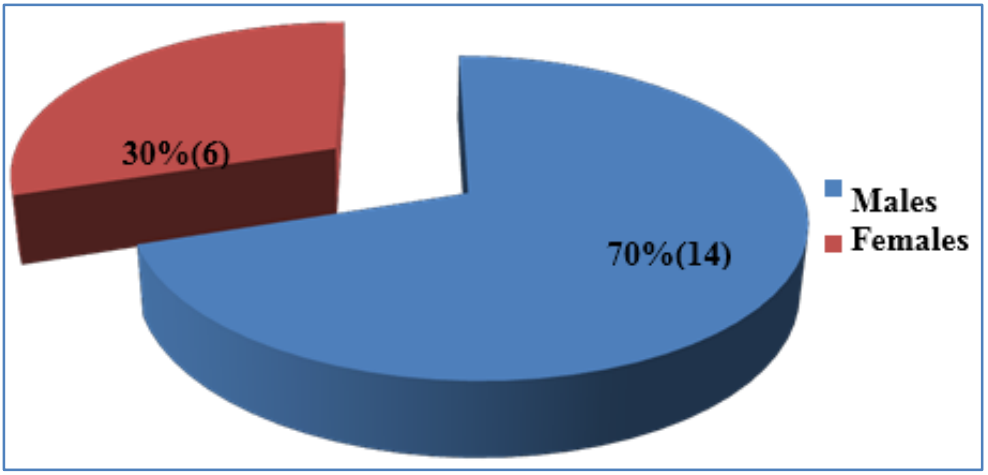

Fig. IV: Mean sex distribution among group III (10 - 12yrs)

In this study among group I i.e 6-7 years age, eyes with pre-operative visual acuity between PL +ve -0.08 LogMar (sub group I) are 8, between0.1- 0.16 LogMar (Sub Group II) are 24 and >0.16 LogMar (Sub group III) are 4.

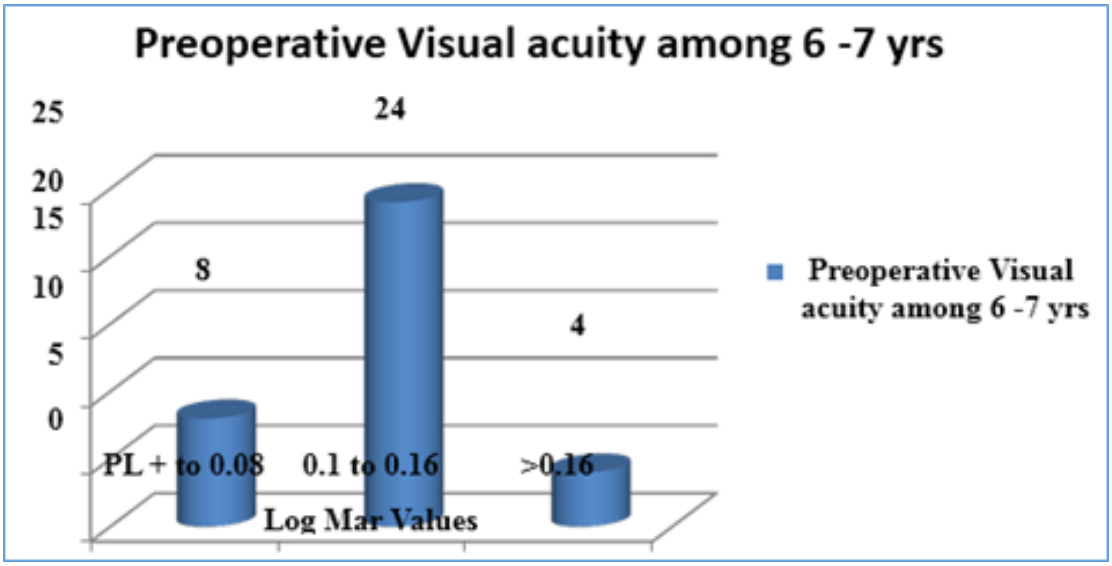

Fig. V: Mean pre op visual acuity among group I i.e 6-7 years age group

In this study among group II i.e., 8-9 years age eyes with pre-operative visual acuity between PL +ve-0.08 LogMar (Sub group I) are 12 ,between0.1- 0.16 LogMar (Sub group II)are 10 and > 0.16(sub group III) are 2.

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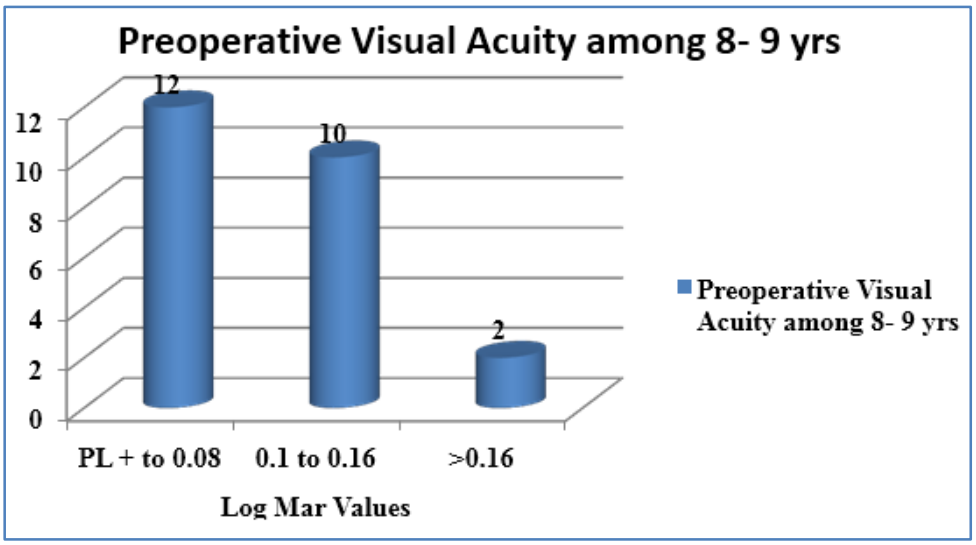
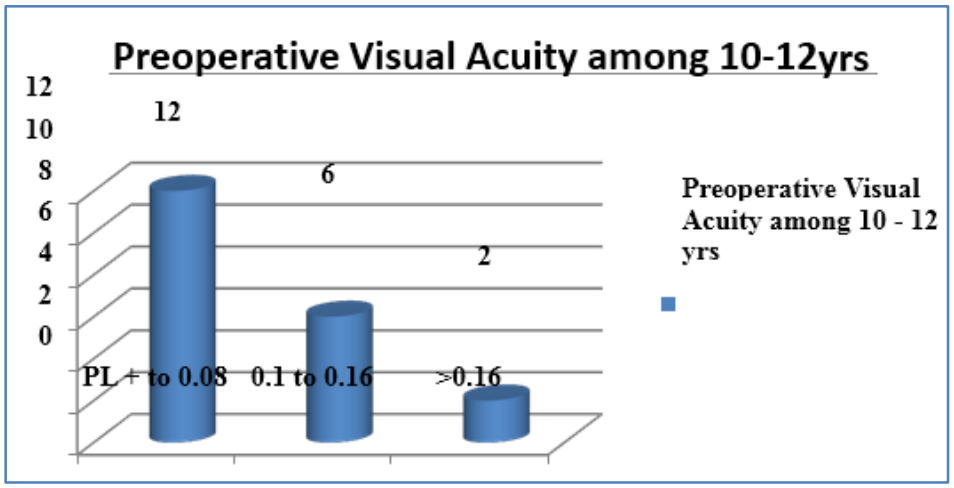


Graph VI: Mean pre op visual acuity among group II i.e., 8-9 years age group

In this study among group III i.e., 10-12 years age eyes with pre-operative visual acuity between PL +ve-0.08 LogMar (Sub group I) are 12, between0.1-0.16 LogMar (Sub group II) are 6 and >0.16 (Sub group III) LogMar are 2.



Graph VII: Mean pre op visual acuity among group III i.e 10-12 years age

In this study among 6-7 years age group, eyes in subgroup I (With pre op Vn PL +ve-0.08 LogMar) had mean pre op VA of 0.01 LogMar improved to 0.16 LogMar post operatively. Eyes in subgroup II (with pre op Vn 0.1-0.16 LogMar) had mean pre op VA of 0.12 LogMar improved to 0.52 LogMar post operatively. Eyes in subgroup III (with pre op Vn >0.16 LogMar) had mean pre op VA of 0.31 LogMar improved to 0.8 LogMar post operatively.

- Eyes in this age group had statistically significant visual improvement ($p < 0.001$)

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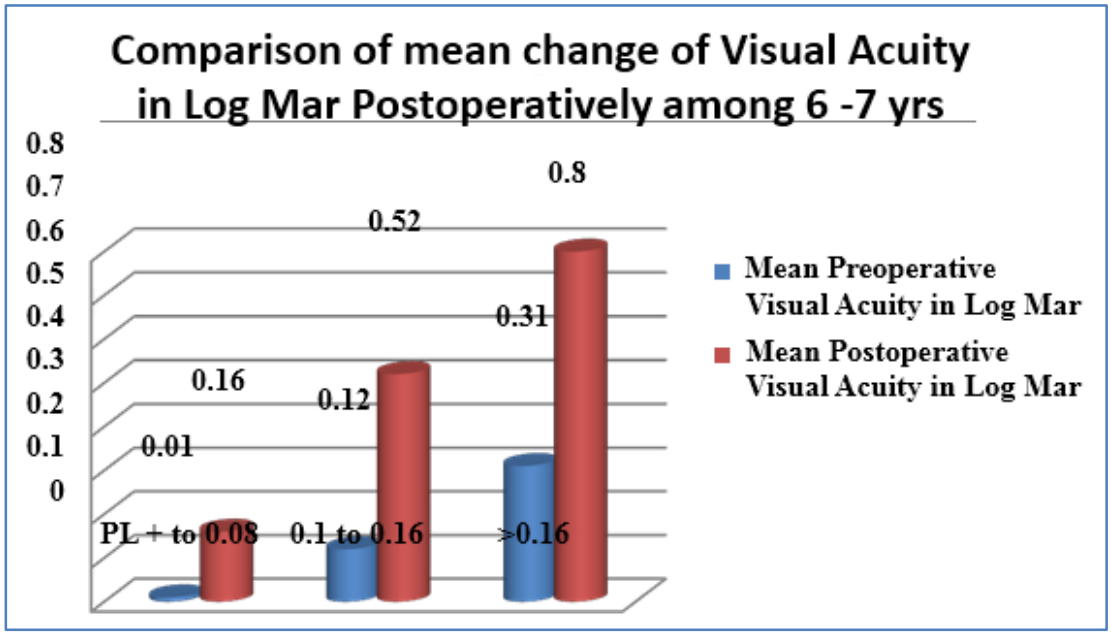

Fig. VIII: comparison of mean change of visual acuity in LogMar post operatively among group I i.e. 6-7 years of age group

	Mean Preoperative Visual Acuity in Log Mar	Mean Postoperative Visual Acuity in Log Mar
PL + to 0.08	0.01	0.16
0.1 - 0.16	0.12	0.52
>0.16	0.31	0.8

In this study among 8-9 years age group, eyes in subgroup I (with pre op Vn PL +ve-0.08 LogMar) had mean pre op VA of 0.03 LogMar improved to 0.14 LogMar post operatively. Eyes in subgroup II (with pre op Vn 0.1-0.16 LogMar) had mean pre op VA of 0.12 LogMar improved to 0.39 LogMar post operatively. Eyes in subgroup III (with pre op Vn >0.16 LogMar) had mean pre op VA of 0.29 LogMar improved to 0.6 LogMar post operatively.

- Eyes in this age group had statistically significant visual improvement($p<0.0014$) but less than group I.

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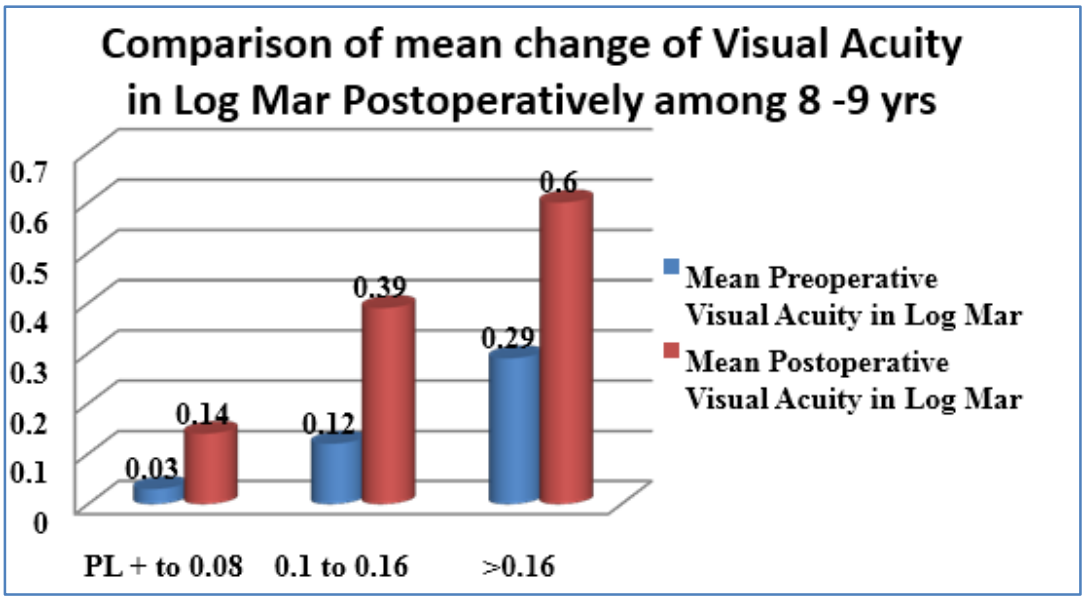

Fig. IX: comparison of mean change of visual acuity in LogMar post operatively among group II i.e. 8-9 years of age

In this study among 6-7 years age group, eyes in subgroup I (With pre op Vn PL +ve- 0.08 LogMar) had mean pre op VA of 0.02 LogMar improved to 0.05 LogMar post operatively. Eyes in subgroup II (With pre op Vn 0.1-0.16 LogMar) had mean pre op VA of 0.11 LogMar improved to 0.18 LogMar post operatively. Eyes in subgroup III (with pre op Vn >0.16) LogMar had mean pre op VA of 0.20 LogMar improved to 0.25 LogMar post operatively

- This group did not have statistically significant visual improvement ($p<0.06$)

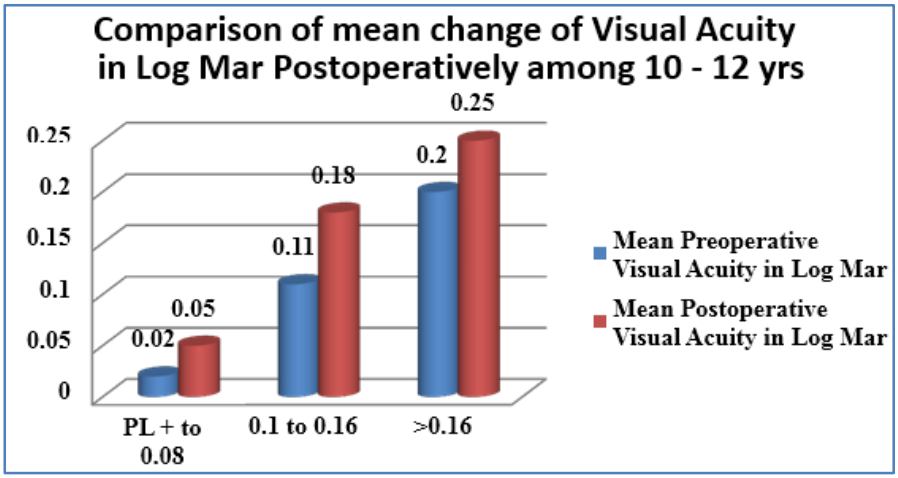

Fig. X: comparison of mean change of visual acuity in LogMAR post operatively among group III i.e. 10-12 years of age

In this study, in 6-7 years age group the post-operative acuities are >0.33in 26 eyes, 0.1-0.25 in 9 eyes and <0.1 in 1 eye. In this age group more number of eyes have improved to >0.33 LogMAR.

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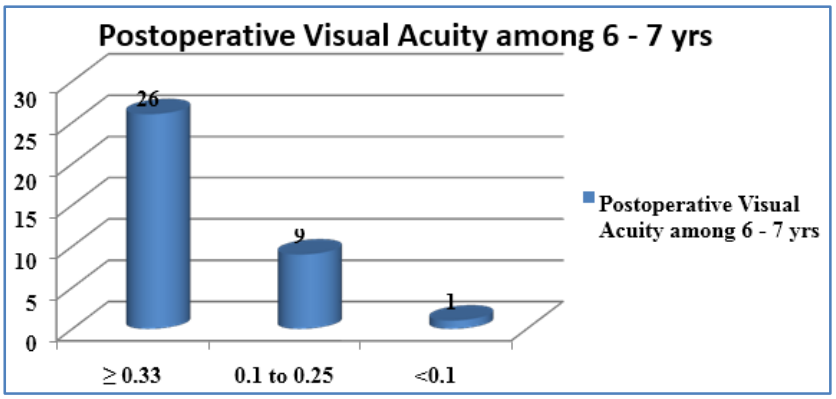

Fig XI- post operative visual acuity in LogMAR among 6-7 years age group

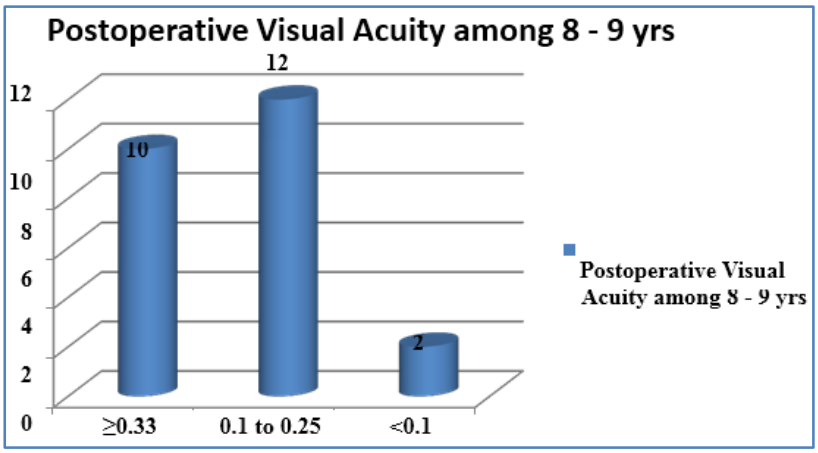

Fig. XII: post-operative visual acuity in LogMar among 8-9 years of age

In this study, in 10-12 years age group the post-operative acuities are >0.33 in 1 eyes, 0.1-0.25 in 9 eyes and <0.1 in 10 eyes. In this age group less number of eyes has improved to >0.33 LogMAR, more number of eyes has vision less than 0.1 Log Mar post operatively.

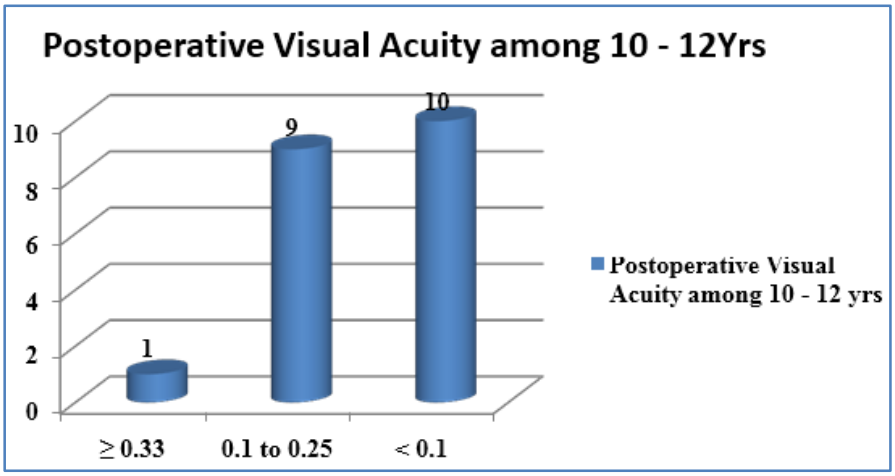

Fig. XIII: Post-operative visual acuity in LogMAR among 10-12 years of age group

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In this study, 26 eyes in group I, 10 patients in group II, 1 eyes in group III improved to >0.33 LogMAR. 9 eyes in group I, 12 eyes in group II, 9 eyes in group III had post op VA between 0.1-0.25 LogMAR. 1 eye in group I, 2 in group II, 10 in group III had post op VA<0.1 LogMAR. Eyes with post op vision >0.33 LogMAR are more in group I. Eyes with post op vision between 0.1-0.25 LogMAR are more in group II. In group III more number of eyes has vision less than 0.1 Log Mar post op.

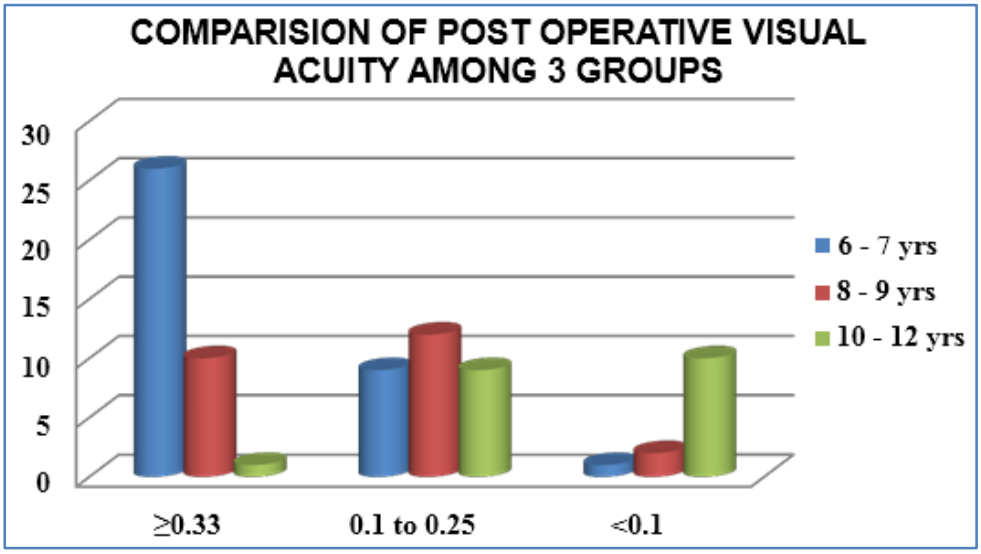

Fig. XIV: Comparison of post-operative visual acuity among 3groups

Age yrs	≥ 0.33	0.1 to	< 0.1
6 - 7	26	10	1
8 - 9	9	12	9
10 - 12	1	2	10

In this study, 1 eye group I, 4 eyes in group II, 14 eyes in group III had <2lines improvement. 10 eyes in group I, 4 eyes in group II, 2 eyes in group III equal to 2 lines improvement. 25 eyes in group I, 16 eyes in group II, 4 eyes in group III had >2 lines improvement. Statistically significant number of eyes has improved to > 2 lines in group I ($p < 0.001$) and group II ($p< 0.004$) and less significant number of eyes in group III.

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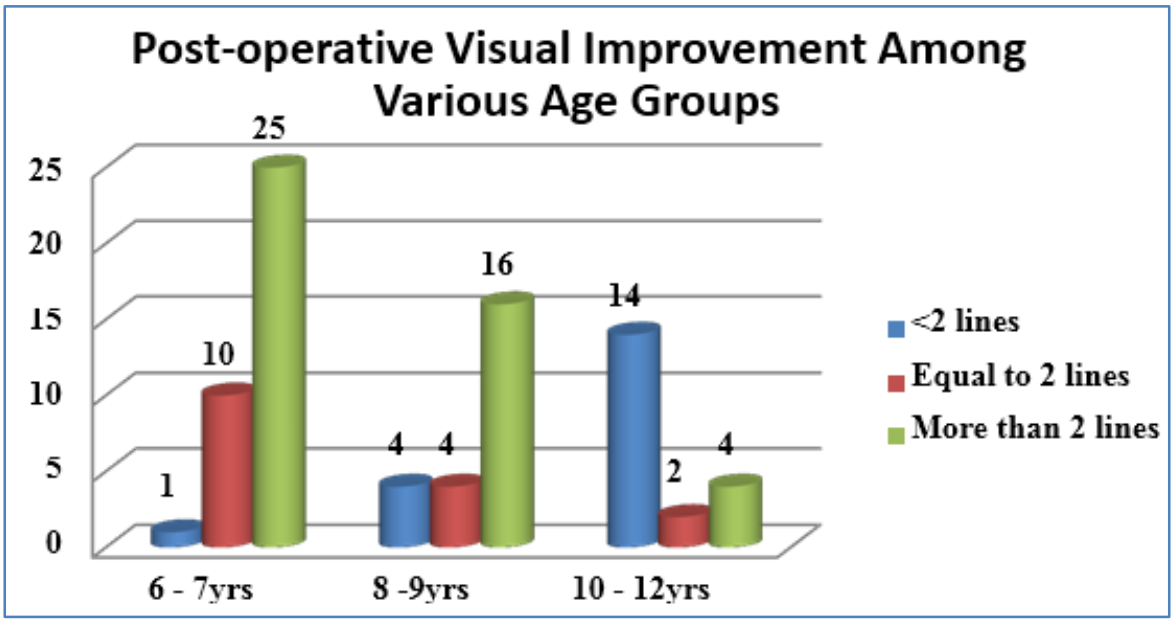

Fig. XV: Comparison of postoperative visual improvement in lines of visual acuity among 3 groups

Age Yrs	< 2 lines	Equal to 2 lines	> 2 lines
6 - 7	1	10	25
8 - 9	4	4	16
10 - 12	14	2	4

DISCUSSION: The ideal surgical intervention for a pediatric cataract should accomplish restoration of clear visual axis, minimal operative, post-operative complications and dependence on Familial compliance with postoperative regime. Visual outcome depends on the age of onset, type of cataract, laterality, method of surgery optical treatment and amblyopia therapy. Results of several animal studies involving rearing under visual deprivation regimens,[26] have provided evidence for the notion of 'critical periods' in visual development. Normal visual input during a short time window early in the lifespan appears to be necessary for normal visual development.

The critical period in animals like mice and kittens is believed to last for a few weeks or months.[26–28] By extrapolation, this period for humans is assumed to transpire within the first 6–8 years of life, although direct data for this extrapolation are weak. Implications of the critical period idea are far-reaching. If visual outcomes in early blind children are likely to be poor beyond the first 8 years of life, then it may be counterproductive to subject children older than 8 years to risks associated with surgery. Refinements in micro surgical techniques enable us to intervene at any age.

Some studies suggest poor visual outcomes in children with bilateral congenital cataracts even with a delay of just a little over 1 year.[29] On the other hand, studies from western India,[30] Nepal,[31] and Tanzania,[32] report visual improvement in cases of delayed cataract treatment. Some of the apparent contradictions across these studies stem from their small sample sizes, variable definitions of 'delay' and the inclusion of both early and late-onset cataracts. In the present study, the

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visual outcome of 30.5% having post-operative visual acuity ≥6/18 is comparable to a study from central India that reported 16.4% having post-operative vision ≥6/18, 33 whereas a study from Pune had 35.5% eyes having post-operative vision ≥6/18, 30 and a series from Nepal that had 36.6% eyes having post-operative vision ≥6/18, 34 but these series included some traumatic cataracts too. We defined CSMF as equivalent to 6/60 or better.[33,34]

Post- operatively, there was significant improvement in visual acuity. Overall, 22.5 % patients had visual acuity less than 6/60 of which 8.01% had visual acuity less than 3/60 in the better eye. This outcome is comparable to results from Nepal,[35] and India,[36,30] but poorer than reports from the developed world.[12,15,17,19,20] This could be due to the duration of follow-up being only 6 months or small sample size . It has been shown that in congenital cataracts, operated earlier in life (Within 1 year), the visual development continues till the age of 10-12 years.[15] Hence, with a long-term follow-up, these children will, expectedly, have further improvement in their visual acuity. Overall, 22.5 % patients achieved visual acuity 6/18 or better in the better eye.

The risk of poor outcome in congenital cataract was nearly 20 times more, especially if operated after the age of 1 year. The reason for poor visual outcome in this study are 8 eyes (10%) have nystagmus, 6 eyes (7%) have exotropia and the reason in other eyes where visual improvement is not significant could be amblyopia. In contrast to a study done by Yorston D20, the reasons for only few eyes having nystagmus in this study could be the cataract was partial at the time of birth or it might have developed in early childhood.In contrast to other authors,[10,13,15,19] the present study showed significant improvement in vision in children with bilateral congenital cataract operated in late childhood (up to 9 years). But in those who are operated late after 9 years, irrespective of pre-operative vision they did not have significant visual improvement. As in other studies,[13,19,20,37] we found that the prognosis was poorer in cases of total cataract with the risk of poor outcome being 4-5 times higher.

In the present study visual outcome after surgery was assessed in 80 eyes of 40 children with bilateral congenital cataract presenting in late childhood below 12yrs. They were distributed in age groups of 6-7, 8-9 and 10-12yrs .45 % fell into Group I of age 6-7yrs, 30 % fell into Group II of age 8-9yrs and 25 % fell into Group III of age 10-12yrs. Each group was further divided in three subgroups depending on preoperative vision -PL+ to CF 5mtrs (Subgroup a); 6/60 to 6/36 Sub group b); >6/36 (Subgroup c). In this study, children in lesser age group (I & II) irrespective of preoperative vision improved to a significant extent after 6 months of amblyopia therapy, whereas children in elder age group III irrespective of pre-operative vision improved to a lesser extent. Thus the visual outcome after congenital cataract surgery in children with bilateral congenital cataract is decreasing with increasing age.

Rogers NK, 10 et al studied the outcome of bilateral pediatric cataract surgery in young children. Eighty-five patients (39.5%) had visual acuity >6/18 in their study. Gelbart SS13 et al., confirmed the best results occurred in patients who underwent surgery before they were 8 weeks old, but our study conducted for age 6-12 years.

Magnusson G 15 et al, study investigated and concluded that visual acuity improves to a considerable extent after school age in children with delayed visual development caused by congenital cataracts. Our study confirms above findings. Surgery within 7 weeks results in a more rapid development of VA, initially.

Wright KW19 et al study reviews the results were good in patients with persistent hyperplastic primary vitreous, posterior lenticonus, and bilateral cataracts.

Khandekar R33 et al., study reviewed pediatric cataract cases in the tribal belt of central India. The study population included the cataract cases in children <or=18 years. In this retrospective study, they found vision following surgery was more than 6/18 in 84 (16.4%) eyes. The vision could not be assessed in 256 (44%) eyes. The study concluded that early detection of cataract, Rubella and trauma are having utmost importance. Our study confirms the delayed presentation of the cases, to the tertiary level hospitals.

Gogate P30 et al., study aimed to investigate the outcome of surgery in cataracts with delayed presentation. At 6 weeks following surgery, vision was ≥6/18 in 36/93 (38.7%) of eyes with delayed presenting cataracts, as compared to 94/244 (38.5%) ≥6/18 in those without. The study concluded that surgery for cataracts with delayed presentation helps to regain functional vision, which can be used for navigation and low vision aids.

Thakur J34 et al concluded that the leading cause of poor outcomes was deprivation amblyopia. In our study, we have significant number of amblyopia cases (≥17%).

Derick RJ35 et al, their study suggested that pattern VER P1 latency may have important predictive power for later visual function in infants with an initially abnormal ophthalmic examination.

Yorston D20 et al studied in African setting and concluded that IOL implantation, at the time of cataract extraction appears to be well tolerated in the short term.

Eckstein M13 et al, their study concluded that aspiration with primary capsulotomy gives an acceptable visual outcome provided there is a follow up to manage capsule opacification. In cases of poor compliance, lensectomy is the best choice.

Garza-Reyes M et al.,[29] evaluated and found that 5 cases (38%) with acceptable VA levels among bilateral congenital cataracts cases with preoperative nystagmus and our study has 8 eyes (10%) with nystagmus The early diagnosis and treatment, in addition to adequate optical rehabilitation, are mandatory.

Suma Ganesh et al [38] studied the visual acuity outcomes and longitudinal changes in postoperative acuity, demonstrated that not only can significant vision be acquired until late in childhood, but that neural processes underlying even basic aspects of vision like resolution acuity remain malleable until at least adolescence.

This study too aimed to know the visual outcomes in late childhood.

Lundvall, A[39] et al study concludes the extra ordinary benefits of early surgery and also the complications like Chronic glaucoma, but our study is confined to the patient's aging 6-12 years.

Sidky M.A et al.,[40] reported four percent of the cases developed postoperative glaucoma Michael O'Keefe[41] et al confirmed the safety and efficacy of bilateral intraocular lens (IOL) implantation in children.

CONCLUSION: In this study children ≤9 years irrespective of preoperative vision improved to a significant extent after 6 months of amblyopia therapy, when compared to children >9 years irrespective of pre-operative vision improved to a lesser extent.

Thus the present study concludes good visual outcomes with lesser age and poor visual outcomes with increasing age. Hence children with bilateral congenital cataract should seek early treatment for better visual outcome.

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