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Original Research Article

Comparison of biometry of eyes having cataract with non-cataractous eyes among children in a tertiary care hospital of Dehradun

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ABSTRACT

Background: Ocular biometry evolves with age and growth. The eyes with cataract but no other abnormality needs biometric assessment for surgical intervention. This study aims to evaluate the keratometry and axial length parameters of eyes with cataract and compare with eyes without cataract and no ocular pathology.
Method: This is a cross sectional, hospital based, observational study. 30 eyes with cataract were assessed for ocular biometry. These eyes were compared with 30 non-cataractous eyes with no other ocular abnormality at that point.
Results: The mean age of presentation of children with cataract was 6.87±4.91 years which was significantly lower than children without cataract 11.27±3.63 years, with p value=0.001. K1 was 44.51±2.44 and K2 was 46.12±2.00 in eyes with cataract. This was significantly different from K1 and K2 of non-cataractous eyes. The Axial length of cataractous eyes was smaller (21.89±1.13 mm) than that of non-cataractous eyes (22.14±3.86), but the difference was statistically insignificant. The data was analysed using Mann Whitney U test; non-parametric test, Student's t test; Parametric test and p value less than 0.05 was considered significant.
Conclusion: The study suggests that eyes with cataract had significantly steeper corneas, and shorter axial lengths in comparison to eyes without any abnormality. This study is a first of its kind to be conducted in the region. Such results help in making better choices in the management of cataract.

Keywords: Cataract, Biometry, Axial length, Keratomery

INTRODUCTION

Cataract in children below the age of 18 years has been a presenting regularly in our ophthalmology department in a tertiary care teaching hospital in Dehradun. It could be due to the increasing awareness among families involved, or an access to a feasible health care facility. With growth in eyeball, the ocular biometry also undergoes change. The corneal diameters, vertical and horizontal at birth are high (around 10 mm) as compared to the adult eye.[1] First six months of life are considered as the rapid growth period of the eye. The new born cornea is more curved especially in the centre than the adult. The dioptric power of cornea has been noted to be around 48 D, that denotes a normal biological variation from adults.[2] The curiosity to understand the biometric parameters of eyes with cataract in comparison to eyes without cataract of children has been the purpose to conduct this study in the northern hilly region of India. Objectives were to study the distribution of axial length and keratometry of eyes having cataract in children. To estimate the axial length and keratometry of non-cataractous eyes in children. To draw comparisons between the two groups.

METHODS

An Observational, cross-sectional study was conducted in our tertiary care hospital, upon seeking approval from the

Ethical committee of the Institute. Only children below the age of 18 years were included in our study, and informed consent was duly sought from their parents or guardians. Two groups were segregated depending on the presence and absence of cataract. 30 eyes having cataract were compared with 30 non-cataractous eyes for their ocular biometry. Children with a history of ocular trauma or active inflammation or infection or any retinal pathology were excluded from the study. A detailed proforma containing the demographic profile, history related to systemic and ocular conditions, and ocular parameters was filled after thorough examination of the patients enrolled in the study. Visual assessment was done with Snellen's chart, or picture chart depending on the patient's age and cooperation. Dilated retinoscopy and fundus evaluation were done and recorded where possible. Children's keratometry was recorded by NIDEK ARK-1/432132/2015 keratometry, and axial length was estimated by Immersion technique with the help of NIDEK ECHOSCAN US 4000/41187/2015, and data was systematically collected to draw reasonable comparisons between eyes with cataract, and those without it.

Statistical analysis

The data was analysed using Mann Whitney U test, non-parametric test, Student's t test, Parametric test and p value less than 0.05 was considered significant.

RESULTS

In group A, 30 patients were screened with cataract, the mean age of presentation was 6.87±4.91 years which was significantly lower than Group B which consisted of 30 patients without cataract 11.27±3.63 years. Mann-Whitney U test results showed that the correlation between the two groups was statistically significant with p value=0.001. In Group A females were 43.3 % and males were 56.7% and in Group B females were 53.3 % and males were 46.7 %. Chi Square test results showed that the correlation between the two groups was statistically insignificant with p value 0.438.

The eyes with cataract (Group A) showed significantly steeper corneas in both the meridian. K1 was 44.51±2.44 mm and steeper than non-Cataractous eyes (Group B) with 43.41±1.29 mm, with p value of 0.034. K2 in Group A was 46.12±2.00 mm which was significantly steeper than non-Cataractous eyes with 44.56 ± 1.30 mm with p value of 0.001. The axial length of cataractous eyes (Group A) was 21.89±1.13 mm, which was smaller than the comparative group (Group B) which was 22.14±3.86 mm, with p value 0.737, however the difference was insignificant. In Group A it showed the prevalence of Bilateral cataract to be 66.7% and prevalence of unilateral cataract to be 33.3%. Chi Square test results showed that the correlation between the two groups was statistically insignificant with p value 0.436. Hence, it shows the prevalence of unilateral cataract more than bilateral cataract. Out of the Two groups, Group A was further screened for K1 and K2 values. K1 was 44.42±2.44 mm in Unilateral cataract and 44.56±2.55 mm in Bilateral cataract with p value of 0.883 which is non-significant.

K2 was 46.37±2.50 mm in unilateral cataract and 45.99± 1.77 mm with p value of 0.640 which is non-significant. Student t test results showed that the correlation between the two groups was statistically insignificant with p value 0.640.

Table 1: Comparison of age in cataractous versus non-cataractous.

	Group 1 (n=30)			Group 2 (n=30)			P value
	Mean±SD	Min-Max	Median (IQR)	Mean±SD	Min-Max	Median (IQR)	
Age	6.87±4.91	1-18 yrs	6 (2-10.25)	11.27±3.63	3-16 yrs	12 (9-14)	0.001*

*Signifies significant p value<0.05. Test used: Mann Whitney U test: Non-parametric test.

Table 2: Gender distribution in cataractous versus non-cataractous eyes.

Gender	Group 1		Group 2		P value
	N	%	N	%	
Female	13	43.3%	16	53.3%	
Male	17	56.7%	14	46.7%	0.438
Total	30	100.0%	30	100.0%	

Test used: Chi square test; Non parametric test.

Table 3: Comparison of biometry between cataractous versus non-cataractous.

	Group 1 (n=30)	Group 2 (n=30)	Median (IQR)
	Mean±SD	Mean±SD	
K1	44.51±2.44	43.51±1.29	0.034*
K2	46.12±2.00	44.56±1.30	0.001*
Axial length	21.89±1.13	44.51±3.86	0.737

*Signifies significant p value<0.05. Test used: Student's test; Parametric test.

Table 4: Laterality of eyes with congenital cataract.

Cataract	Group 1		P value
	N	%	
Bilateral	20	66.7%	0.436
Unilateral	10	33.3%	
Total	30	100.0%	

Table 5: Comparison of biometry between unilateral versus bilateral cataract.

	Unilateral (n=10)	Bilateral (n=20)	P value
	Mean±SD	Mean±SD	
K1	44.42±2.44	44.56±2.55	0.883
K2	46.37 ± 2.50	45.99±1.77	
Axial length	22.06±1.29	21.81±1.06	

Test used: Student's t test; Parametric test.

DISCUSSION

In the present study, 30 eyes with cataract were compared with 30 eyes without cataract. There were 56.7% boys and 46.3% girls among children presenting with cataract. The children were in the range of one to 18 years with mean age was 6.87±4.91years. In a study by Sahu et al, the mean age of presentation of cataract in children was found to be 7 years (approximately 6 months to 15 years). The ratio of boys to girls was 2.34:1 in their study.[3-5]

In the present study, the mean axial length in cataractous eyes was 21.89±1.13 mm which smaller than non-cataractous eyes. Also, bilaterality of cataract was found in 66.7% of eyes with cataract. There was no significance regarding the biometric findings of unilateral and bilateral cataract.

In a study in Nepal, the axial length in cataractous eyes in bilateral cases (21.46±2.05 mm) was significantly less compared to unilateral cases, which was 22.55 mm, while the mean axial length was 21.94±1.94 mm. The mean axial length was higher in cataractous eyes in boys at 22.11 mm than in girls at 21.53 mm. However, the comparison of mean axial length between males and females by age distribution was found to be significant in the age group between 11-15 years (p=0.007). U Kugelberg et al have also reported a smaller axial length in all eyes with congenital cataract than the normal fellow eye. The difference in axial length was shown to be around 0.16mm, which was statistically significant (P <0.01).[6-8]

In a study by Trivedi et al, the mean age of 310 subjects who were studied, was found to be 45.30±48.10 months with an axial length (AL), 20.52±2.87 mm. The axial length was found to be significantly shorter in girls than the boys (p=0.090), and the African-American subjects had longer ALs than did the caucasians (p<0.001). They also suggested a transition in the length with cataract as below 60 months of age, the unilateral cataracts had shorter axial lengths than bilateral cataracts, whereas after 60 months of age, it became vice-versa.[9-11] Renu Jivrajka et al have reported an inverse correlation between axial length and lens thickness, age and corneal power.[12-14]

In the present study, the non-cataractous eyes longer axial lengths with a mean of 22.14±3.86 mm. In a Swedish study by Hellström et al on 92 healthy eyes of children in the age group of 1 month to 16 years, it was found a marked increase in total axial length during the first 2 years of life. Girls with FAS had a shorter total axial length (p=0.045) than their controls.[15,16]

Rodrigo Bueno et al in their study on forty-four children with mean age 27.3 months have found a mean axial length of 20.63±2.11 mm. The value of axial length was significantly shorter in younger children (p<0.001). The study reported no significant differences were found neither between eyes with unilateral and bilateral cataracts nor between eyes with unilateral cataract and their corresponding healthy eyes (p>0.05).[17,18]

In our study, the mean keratometry readings of cataractous eyes in both the were found to be steeper significantly than non-cataractous eyes. Our study is consistent with a similar study from Nepal that observed a mean keratometry of 44.12±2.6 D. Girls reported to have a larger mean keratometry of 44.71 D as compared to boys having 43.88 D with a p value of 0.0032. Keratometry values were higher in cataractous eyes in bilateral cases than in the unilateral cases (44.61 D vs 43.51 D, p<0.0001).[3] Trivedi and Wilson in their study observed that keratometry values of younger children were steeper as compared to that older child. Girls had steeper corneas in comparison to boys with a p value of 0.03. Steeper corneas were noted in eyes with cataract in monocular cases as compared to bilateral cases. Among monocular cases, corneas were significantly steeper than fellow non cataractous eyes (p=0.02).[19,20] Rodrigo Bueno do Prado in their study on Brazilian children found the K value significantly steeper in congenital and developmental cataract.[8] A study by Shrestha on children

in the range of one to 168 months with a mean age of 69.7 months, revealed that keraometry in bilateral paediatric cataract had similar values. The mean keratometry reading was 44.8 (SD=2.7) in those which got operated, and 44.7 (SD=2.6) in the fellow eye respectively.[21,22]

Lin, Duoru et al, has conducted a study on 400 congenital cataract children with mean age being 54.27 months. 71.8% were diagnosed with the rule astigmatism implying a more curvature of cornea. The astigmatism was significantly larger in eyes having cataract than non-cataractous eyes with females having larger but thinner keratometry.[11] This is quite different from a study by Chen, Jiahui et al. In which the preoperative ocular biometry was suggestive of shorter axial length, larger keratometry, and higher astigmatism among females with unilateral congenital cataracts. The study showed that Females had shorter axial length, but the keratometry and astigmatism were significantly larger than that in males.[23]

Our study can be considered unique as it is first of its kind and covers a variety of demography involving the plain area as well as patients from hilly regions. The limitation could be attributed to a small sample size which might be reflection a small section of population. India is diverse with many ethnicities, and thus more studies from different parts could contribute to existing information.

CONCLUSION

Axial length, and keratometry are parameters which help us to understand the functional ability of the eye. The comparison of cataractous eyes with non-cataractous guides us in dealing with a plethora of conditions including refractive errors, and congenital cataract. It enables us to choose the right approach in cataract and refractive surgery.

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