

Association of Ametropia in Children with the Refractive Status of Their Parents: A Case Control StudyNimi R.¹, Nishi R.S.², Anitha S.³¹Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology, Thiruvananthapuram, Kerala, India.²Assistant Professor, Department of Ophthalmology, Government medical college, Kottayam, Kerala, India.³Professor, Department of Ophthalmology, Regional Institute of Ophthalmology, Thiruvananthapuram, Kerala, India.

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Conflict of interest: Nil

Abstract:**Background:** Refractive error is the condition in which incident parallel rays of light do not come to a focus upon the retina. It is one of the important causes of treatable visual impairment among children. Most of the refractive errors are potentially correctable with spectacles which is relatively an inexpensive modality of treatment. Aim of the study is to find out whether there is any association between the refractive status of children and their parents**Methods:** A case-control study was conducted in 2018-2019. 232 cases and 208 controls were included in the study. Cycloplegic refraction was done with or without post mydriatic test. Parental refraction was also assessed.**Results:** A total of 440 children were included in the study; 232 cases and 208 controls. Among the cases 41.3% were males and 58.6% were females. 43.8% were males and 56.2% were females among the control group. In 30.6% children with unilateral refractive errors, only single parent had refractive error (p value-0.005) and in 5.6% ,both parents had refractive errors (p value 0.013). Both were statistically significant. Parents of 31.7% of cases with refractive errors in both eyes had unilateral refractive error (p value-0.011) and 5.5% had refractive error in both eyes (p value-0.011). Both were statistically significant. Among the control group, 1.9% had refractive errors in both the parents; whereas 20.2% has refractive error in a single parent. The parents of 61.5% cases had refractive errors. This was found to be statistically significant (p value – 0.005). In 30.6% children with unilateral refractive error, only single parent had refractive error (p value-0.005) and 5.6% both parents had refractive errors (p value-0.031%) which were found to be significant. In 31.7% of children with refractive error in both the eyes, only one parent had refractive error (p value-0.011) and 5.5% had refractive error in both the parents (p value-0.011). Both were found to be significant.**Conclusion:** The results of the present study shows a strong association between the refractive status of children and their parents. This points towards the importance of regular screening of children of ametropic parents for the development of any refractive error as they grow.**Keywords:** Refractive error, Ametropia, emmetropia, cycloplegic refraction, parental refraction.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Emmetropia is the absence of any refractive error and light rays come to a focus on the retina when accommodation is at rest. Ametropia (refractive error) is the condition in which incident parallel rays of light do not come to a focus upon the retina. It is one of the important causes of treatable visual impairment among children. Common refractive errors include Myopia, Hypermetropia and Astigmatism. These are due to the structural and refractive changes of the eye.

In children, more often refractive errors go unnoticed as they rarely complain of defective vision which is usually very late. Hence there may be a delay in diagnosis until they develop symptoms like headache, eyestrain, abnormal head postures they adopt while

reading etc. Uncorrected refractive error can lead to poor scholastic performance and socialization and more importantly to Amblyopia or permanent visual disability. This in turn affects the work productivity and quality of life. Vision 2020, the global initiative for the elimination of preventable and treatable causes of blindness, includes refractive error as one of its priorities.

Most of the refractive errors are potentially correctable with spectacles which is relatively an inexpensive modality of treatment. Uncorrected refractive errors can lead to amblyopia. Amblyopia is a condition with unilateral /bilateral subnormal vision without any structural abnormality of the eye or the

posterior visual pathway. If treated early, it can be reverted and thus it is a preventable cause of childhood blindness. To prevent amblyopia, children with refractive errors have to be identified and treated at an early age. It has been found that high myopia and hypermetropia run in families[1]. There are many studies showing the genetic and environmental factors influencing refractive errors.[2,3,4] Not much studies are there relating to lower degrees of refractive error and its association with parental refraction. This study is an effort to find an association between the refractive status of ametropic and emmetropic children with their parents. If an association is found then refractive errors in children of ametropic parents can be identified and treated early.

Objectives

To find out whether there is any association between the refractive status of children and their parents, among those who attend the out-patient department, Department of Ophthalmology, Government Medical College, Kollam.

Materials and Methods

This is a case control study which was carried out in the department of Ophthalmology, Government Medical College, Kollam. Institutional ethics committee approval was obtained. Informed consent from the parents and assent from children above 7 years were obtained. Study period was from 2018-2019. Children between the 2 and 15 years of age with unilateral or bilateral myopia/ hypermetropia/ astigmatism or in combination after cycloplegic refraction with or without post mydriatic tests were included as cases. Children between 2 and 15 years of age with visual acuity of 6/6 with Snellen’s chart or retinoscopy value appropriate for the age in both eyes after cycloplegic refraction. Single parented children and those who were hypersensitive to cycloplegic

drugs were excluded. Children and parents with any other ocular illnesses, sequale of ocular trauma were also excluded from the study

Sample Size

Sample size is calculated using the formula $(Z\alpha/2+Z\beta)^2 (p_1q_1 + p_2q_2) / (p_1 - p_2)$. A total of 440 children were included. 232 cases and 208 controls were included in the study

Study Procedure

Children attending the out-patient department were given appointments for cycloplegic refraction using Homatropine eyedrops instilled at 30 minutes interval for 4 times. Retinoscopy was done. Anterior and posterior segments were examined. Post mydriatic test was done after 4 days. Then the children are allocated into two groups according to their vision/retinoscopy value: cases and controls satisfying the operational diagnosis. Vision testing and subjective refraction were done for the parents of these children.

Statistical Analysis

Data was entered in Microsoft excel and Chi-square test was used to find the statistical association between categorical variables.

Results

A total of 440 children were included in the study; 232 cases and 208 controls. Among the cases 41.3% were males and 58.6% were females. (figure-1) 43.8% were males and 56.2% were females among the control group (figure-2) The most common refractive error in both children and parents was simple myopic astigmatism. 70.6% of cases and 55.2% of controls were below 10 years of age (Figure-3, table-1).

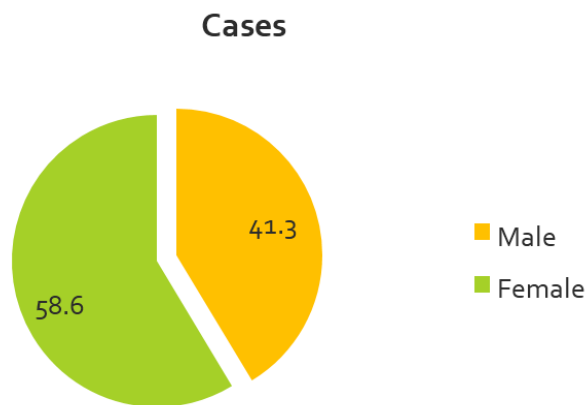


Figure 1: Cases

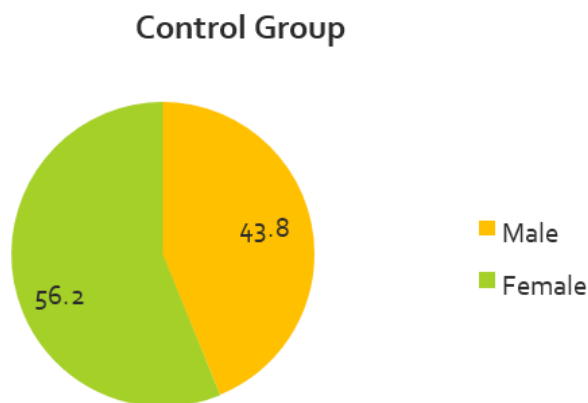


Figure 2: Control Group

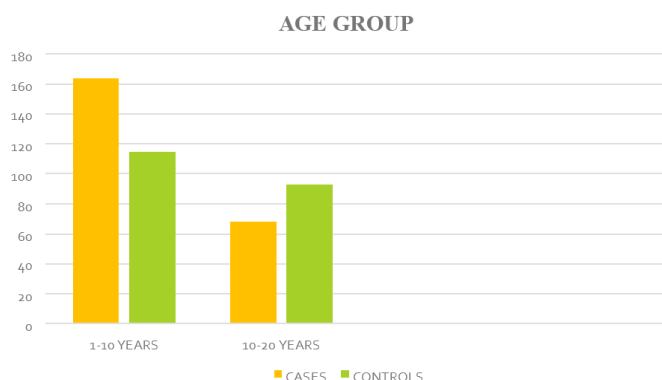


Figure 3: Age Group

Table 1: Age and sex distribution among cases and controls

Variables	Cases	Controls
Age group		
1-10 years	164(70.6%)	115(55.2%)
10-20 years	68(29.3%)	93(44.7%)
Sex		
Male	96(41.4%)	91 (43.8%)
Female	136 (58.6%)	117 (56.2%)

Age and sex distribution among cases and controls (N=440)

Table 2: Association between the refractive status of children and their parents

Variables	Refractive error of child		Total	Significance
	Yes	No		
Father refractive error				0.038
Yes	39 (63.9%)	22 (36.1%)	61 (100.0%)	
No	186 (49.1%)	193 (50.9%)	379 (100.0%)	
Mother refractive error				0.031
Yes	53 (61.6%)	33 (38.4%)	86 (100.0%)	
No	172 (48.6%)	182 (51.4%)	354 (100.0%)	
Parents refraction error				0.005
Yes	80 (61.5%)	50 (38.5%)	130 (100.0%)	
No	145 (46.8%)	165 (53.2%)	310 (100.0%)	

Refractive error was found among 13.6% (61/440) of fathers and 19.5% (86/440) of mothers of the sample children (Table-2). The parents of 29.5% (130/440) cases had refractive errors. Among them, 61.5% of their children had refractive errors. This was found to be statistically significant (p value =0.005).Among the fathers who had refractive error, 63.9% of their

children had it. And among the mothers who had refractive error, 61.6% had children with refractive error. Both are statistically significant.

Refractive error among children was found to be significantly higher among those whose parents had refractive error compared to their counterparts (61.5% vs. 46.8%).

Association of unilateral refractive error in children with their parents.

The following tables (Table-3, Table-4) shows that unilateral refractive error was significantly higher

among those whose single parent had refractive error and the same trend is found among those both parents had refractive error

Table 3: Association of unilateral refractive error in children

Parents refractive error	Unilateral refractive error of child		Total	Significance
	Yes	No		
Yes	80 (61.5%)	50 (38.5%)	130 (100.0%)	0.005
No	145 (46.8%)	165 (53.2%)	310 (100.0%)	

Table 4: Association of unilateral refractive error in children with their parents.

Refractive error	Unilateral refractive error of child	significance
Single parent	71(30.6%)	0.005
Both parents	13(5.6%)	0.013

In 30.6% children with unilateral refractive errors, only single parent had refractive error (p value-0.005) and in 5.6%, both parents had refractive errors.(p value 0.013).Both were statistically significant.

Parents of 31.7% of cases with refractive errors in both eyes had unilateral refractive error (p value-0.011) and 5.5% had refractive error in both eyes (p value-0.011). Both were statistically significant.

Among the control group, 1.9% had refractive errors in both the parents; whereas 20.2% has refractive error in a single parent.

Discussion

In this study we have tried to bring out the association of refractive errors of children with the refractive status of their parents. A total of 440 children were included in the study-232 cases and 208 controls. 41.3% were males and 58.6% were females among the cases showing a slight female preponderance. 43.8% were males and 56.2% were females among the control group. The most common refractive error in children and parents were simple myopic astigmatism.

Majority of the cases belonged to the age group of 1-10 years 70.6% of cases and 55.2% of controls. The parents of 61.5% of cases had refractive errors. In the study by Sneha Mittal et al[5], family history of refractive errors was found to be significant. But both parents and siblings were included in their study. Here we have considered the refractive status of the parents alone. Another study by Yingyong et al[6] showed significant association with positive family history of refractive error along with hours of near work. A study by Kannan et al[7] found that refractive error in children was higher when both parents had refractive errors.

In the present study, 63.9% of cases, only fathers had refractive error(p value 0.038)and in 61.6% of cases, only mothers had refractive error(p value-0.031). Both were found to be significant and shows association of refractive error in a child even if only one parent has refractive error. In the study by Ur MZ Rehman et al[8], 65.3% of fathers, 49.5% of mothers and 43.7%

of siblings had refractive errors and concluded that a positive family history was an important risk factor in development of refractive errors. In 30.6% children with unilateral refractive error, only single parent had refractive error(p value-0.005) and 5.6% both parents had refractive errors(p value-0.031%) which were found to be significant.

In 31.7% of children with refractive error in both the eyes, only one parent had refractive error p value-(0.011) and 5.5% had refractive error in both the parents(p value-0.011).

Both were found to be significant. Prema et al[9] also found significant association of refractive error in children with refractive error in either or both the parents. This highlights the relevance of early screening of children for refractive errors even if only single parent is affected.

Conclusion

The results of the present study shows a strong association between the refractive status of children and their parents. This points towards the importance of regular screening of children of ametropic parents for the development of any refractive error as they grow. If identified and corrected early, the burden of the visual loss due to uncorrected refractive errors can be reduced to a great extent.

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