CLINICAL PATTERN OF REFRACTIVE ERRORS AMONG SCHOOL CHILDREN BETWEEN 7 TO 15 YEARS OF AGE WHO PRESENTED TO RIOGOH, CHENNAI

Geetha Periasamy[1], Harivanzan Vijayakumar[2], Shakila Arulprakasam[3]

[1]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Egmore, Chennai.
[2]Junior Resident, Department of Ophthalmology, Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Egmore, Chennai.
[3]Junior Resident, Department of Ophthalmology, Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Egmore, Chennai.

ABSTRACT

BACKGROUND
Uncorrected and undetected refractive error is an avoidable cause of visual impairment. Refractive error is one of the leading causes of visual disability in children which can lead to childhood blindness.

The aim of the study is to study the prevalence of refractive error among school going children between 7-15 years of age.

MATERIALS AND METHODS
A descriptive, cross sectional study was carried out on 100 school children (7-15 years of age) attending Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Chennai during the period April 2017 to September 2017. They were screened and examined for refractive error as per basic standards.

RESULTS
Out of total 100 children included in the study, 92 of them had refractive errors, out of which 53 were males and 39 were females respectively. Out of the total participants, 25% had hypermetropia, 14% had hypermetropic astigmatism, 12% had myopia, 41% had myopic astigmatism and 8% were emmetropic. Mean age of hypermetropia was 9 years, hypermetropic astigmatism was 9.29 years, myopia was 11.67 years and myopic astigmatism was 10.46 years. Pearson correlation analysis was done. Watching TV was negatively correlated with reading hours i.e., as the usage of television increases, reading hours decreases; was statistically highly significant. As the usage of television increases, the uncorrected visual acuity increases in both eyes which was statistically highly significant. Using cell phones was negatively correlated with reading hours i.e., as the usage of cell phone increases, reading hours decreases which was statistically highly significant. As the usage of cell phones increases, the uncorrected visual acuity increases in both eyes which was statistically highly significant. Uncorrected visual acuity had negative correlation with reading hours which means, there was decrease in vision, the reading hours also decreases. Early detection and treatment of refractive error is necessary.

CONCLUSION
Screening helps in early detection and timely intervention of refractive errors which prevents amblyopia which is one of the leading cause of avoidable blindness.

KEYWORDS
Refractive error, school children, astigmatism, myopia, hyperopia, amblyopia.

BACKGROUND
Refractive error is considered as a curable cause among other causes leading to visual disabilities in children.

According to the Right to Sight Initiative of the World Health Organisation,[1] undetected and uncorrected refractive errors are found to be a significant cause for visual disability among school children which can lead to childhood blindness.

World health organization (WHO) estimated that 19 million children have vision impairment. Out of them, 12 million children have vision impairment due to refractive error. The major global causes of moderate to severe visual impairment are uncorrected refractive errors 53%, cataract 25%, age related macular degeneration 4%, glaucoma 2%. Uncorrected refractive error contributes to 21% of blindness.[2]

Visual acuity (VA) allows for the estimation of the magnitude of visual impairment due to refractive errors. Blindness is defined as best corrected visual acuity (VA) of 3/60 or worse in the better seeing eye.[3] VISION 2020 initiative is to eliminate avoidable blindness and hence given high priority for correction of refractive error and has placed it within the category of "childhood blindness."[4]

Refractive error occurs when parallel rays of light are not exactly focused on retina when eye is in the state of rest. When the refractive conditions of two eyes are not equal, it is termed as anisometropia. Refractive errors can be classified as myopia, hypermetropia and astigmatism.[5] Defective vision due to refractive error can profoundly affect a child's participation both inside and outside the classroom. The study was conducted with the aim of assessing the prevalence of refractive error among school children between 7-15 years based on sex, family h/o, duration of using gadgets, duration of watching television, duration of reading books and studying institution.

MATERIALS AND METHODS

A cross sectional study was carried out on 100 School children (7-15 years of age) attending RIOGOH, Chennai during the period April 2017 to September 2017. Screening was done with Snellen's chart at 6m distance and picture chart was used for children who were uncooperative for regular Snellen's chart. Children with visual acuity less than 6/9 were subjected for cycloplegic refraction in the clinic. Best corrected visual acuity was obtained by subjective verification. School children between 7-15 years of age, children with squint were included in the study. Exclusion criteria were media opacity like pre-existing corneal opacities, opacity of the lens, detectable posterior segment lesions.

If the vision improved to 6/6 or better with refraction in the absence of any obvious pathology, then refractive error was considered as the cause for visual impairment. When there was no improvement in vision with refraction in the absence of any identifiable pathology then amblyopia was considered as the cause for vision impairment.

Data Analysis

Data collected were entered in Excel spread sheet and analysed using STATA statistical software package release 11. We used the two-sided independent samples T test to compare means across dichotomous variables. The one-way ANOVA test for comparison of mean across multilevel variables. Simple calculations like percentages, proportions and mean values were derived. A Type I error of 0.05 was considered in all analysis. For analysis purpose the visual acuity which was measured in Snellen's chart was converted into logMAR.

RESULTS

Totally 100 participants participated in the study. The mean age of the study population was 10.08 years, the youngest was 7 years old and the oldest was 15 years old.

The mean hours of watching television was 2.27 hours per day, reading was 2.09 hours per day, watching cell phones was 2.73 hours per day. Mean uncorrected visual acuity UCVA in right eye was 0.445 and left eye was 0.388. Mean best corrected visual acuity BCVA in right eye was 0.042 and left eye was 0.057.

Out of total 100 children subjected for study, 92 of them had refractive errors out of which 53 were males and 39 were females respectively. Out of the total participants 25% had hypermetropia, 14% had hypermetropic astigmatism, 12% had myopia, 41% had myopic astigmatism and 8% were emmetropic. Mean age of hypermetropia was 9 years, hypermetropic astigmatism was 9.29 years, myopia was 11.67 years and myopic astigmatism was 10.46 years.

Shift in Refractive Error
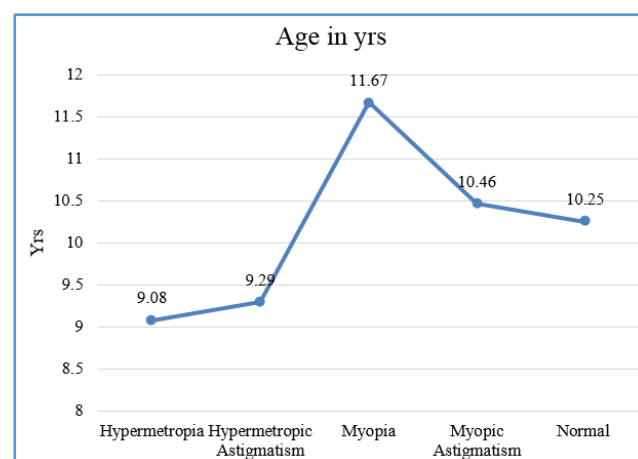
Graph 1

The graph shows a shift in refractive error from hypermetropia to myopia as the age increases with peak incidence around the pubertal age group between 10-12 years.

Mean hours of watching television in hypermetropia, hypermetropic astigmatism, myopia, myopic astigmatism were 2.12 hours, 2.36 hours, 2.50 hours, 2.39 hours respectively. Mean hours of reading in hypermetropia, hypermetropic astigmatism, myopia, myopic astigmatism were 2.06 hours, 2.14 hours, 2.17 hours, 1.98 hours respectively. Mean hours of watching cell phone in hypermetropia, hypermetropic astigmatism, myopia, myopic astigmatism were 2.76, 2.68, 2.92, 2.85 respectively.

Incidence of Myopia in Children
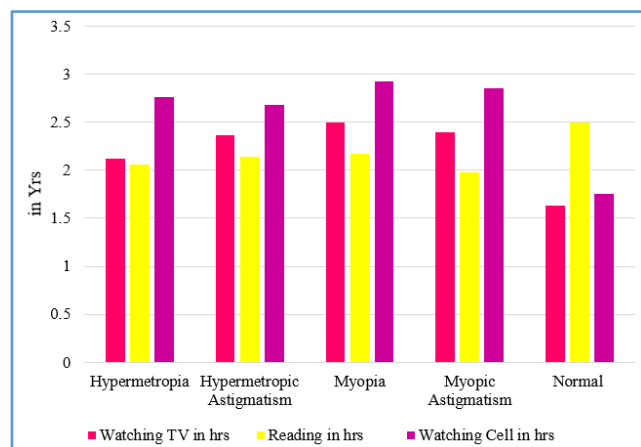
Graph 2

This bar diagram shows higher incidence of myopia in children with increased hours of watching tv, reading books and using cell phones.

Among the refractive errors, the mean value was found to be high in myopia, followed by myopic astigmatism, hypermetropic astigmatism and hypermetropia. The mean value of best corrected visual acuity was high in myopic astigmatism followed by myopia, hypermetropia and hypermetropic astigmatism.

Mean Values in Various Refractive Errors
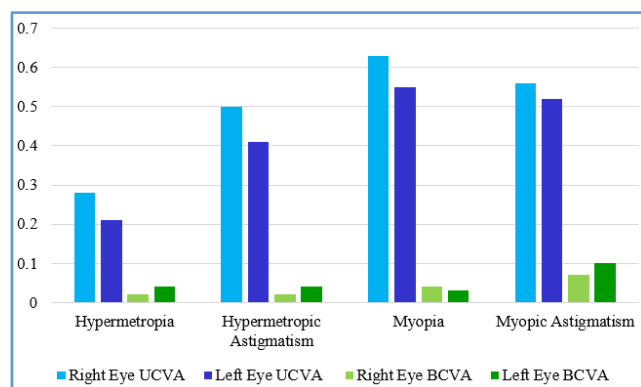
Graph 3

The bar diagram shows a higher prevalence of myopia in uncorrected refractive errors and a good BCVA in myopic astigmatism.

Pearson correlation analysis was done. Watching TV was negatively correlated with reading hours i.e., as the usage of television increases, reading hours decreases which was statistically highly significant. As the usage of television increases, the uncorrected visual acuity increases in both eyes which was statistically highly significant. Using cell phones was negatively correlated with reading hours i.e., as the usage of cell phone increases, reading hours decreases which was statistically highly significant. As the usage of cell phones increases, the uncorrected visual acuity increases in both eyes which was statistically highly significant. Uncorrected visual acuity had negative correlation with reading hours which means as there was decrease in vision, the reading hours also decreases.

Variable	N	Mean	Std. Dev.	Min	Max
Age in Years	100	10.08	2.43	7	15
Watching TV in hrs	100	2.27	0.91	1	4
Reading in hrs	100	2.085	0.78	0.5	4
Watching Cell in hrs	100	2.725	0.97	1	4
Right Eye UCVA	100	0.445	0.41	0	1.5
Left Eye UCVA	100	0.388	0.39	0	1.3
Right Eye BCVA	100	0.042	0.13	0	0.6
Left Eye BCVA	100	0.057	0.17	0	1.2
Table 1. Comparison Data					

UCVA – Un Corrected Visual Acuity.
BCVA – Best Corrected Visual Acuity.

Variables	Hypermetropia		Hypermetropic Astigmatism		Myopia		Myopic Astigmatism		Normal	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
N	25.00		14.00		12.00		41.00		8.00	
Age in years	9.08	1.53	9.29	2.37	11.67	2.19	10.46	2.67	10.25	2.60
Watching TV in hrs.	2.12	1.05	2.36	0.74	2.50	0.67	2.39	0.92	1.63	0.74
Reading in hrs	2.06	0.68	2.14	0.86	2.17	0.83	1.98	0.72	2.50	1.07
Watching Cell in hrs	2.76	1.01	2.68	0.91	2.92	0.90	2.85	0.91	1.75	1.04
Right Eye UCVA	0.28	0.35	0.50	0.42	0.63	0.34	0.56	0.40	0.00	0.00
Left Eye UCVA	0.21	0.33	0.41	0.36	0.55	0.37	0.52	0.39	0.00	0.00
Right Eye BCVA	0.02	0.12	0.02	0.08	0.04	0.14	0.07	0.16	0.00	0.00
Left Eye BCVA	0.04	0.13	0.04	0.11	0.03	0.09	0.10	0.23	0.00	0.00
Table 2. Comparison Table between Refractive Errors										

UCVA – UnCorrected Visual Acuity,   BCVA – Best Corrected Visual Acuity

	Hypermetropia		Hypermetropic Astigmatism		Myopia		Myopic Astigmatism		Normal	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Gender										
Female	7	28	4	28.57	8	66.67	20	48.78	6	75
Male	18	72	10	71.43	4	33.33	21	51.22	2	25
Community										
Rural	5	20	3	21.43	3	25	8	19.51	3	37.5
Urban	20	80	11	78.57	9	75	33	80.49	5	62.5
H/o Mother Wearing Glasses										
No	21	84	12	85.71	9	75.00	24	58.54	6	75
Yes	4	16	2	14.29	3	25.00	17	41.46	2	25
H/o Father Wearing Glasses										
No	24	96	12	85.71	11	91.67	27	65.85	7	87.5
Yes	1	4	2	14.29	1	8.33	14	34.15	1	12.5
H/o Sibling Wearing Glasses										
No	23	92	13	92.86	11	91.67	32	78.05	7	87.5
Yes	2	8	1	7.14	1	8.33	9	21.95	1	12.5
Educational Status of Parents										
Educated Father	23	92	14	100.00	10	83.33	41	100.00	7	87.5
Educated Mother	20	80	13	92.86	11	91.67	35	85.37	5	62.5

Table 3. Social Economic Correlation of Refractive Errors

Pearson Correlation	Correlation Coefficient	P Value
Watching TV in hrs.		
Reading in hrs.	-0.291	<0.01
Right Eye UCVA	0.4669	<0.01
Left Eye UCVA	0.3479	<0.01
Watching Cell Phone in hrs.		
Reading in hrs	-0.377	<0.01
Right Eye UCVA	0.519	<0.01
Left Eye UCVA	0.576	<0.01
Reading in hrs.		
Right Eye UCVA	-0.164	>0.05
Left Eye UCVA	-0.107	>0.05

Table 4. P value

DISCUSSION

In our study prevalence of refractive error was more common in boys (53%) than girls (39%). Refractive error was found to be more common in urban than rural population which can be attributed to the increased awareness among the educated parents which makes them accessible for early screening. Prevalence of refractive error among school children of 7-15 years of age was found to be high. Pavithra et al. in their study of uncorrected refractive errors, among school children of 7-15 years in the field practice area of a medical college in Bangalore, India, found that the prevalence of myopia, hyperopia and astigmatism were 4.4%, 1.03% and 1.6% respectively.[6] Prevalence rate of refractive errors of about 32% has been reported among

children of age 3-18 years.[7] Matta et al reports a prevalence of 12.5%.[8] Datta et al reports a prevalence of refractive errors (2%) from Eastern India among primary school children (5-13 years), which could not be explained.[9] Padhye et al reports cluster-weighted prevalence of uncorrected refractive error in urban and rural children was 5.46% (95% CI, 5.44-5.48) and 2.63% (95% CI, 2.62-2.64), respectively. A study reports prevalence of myopia, hypermetropia and astigmatism in urban children as 3.16%, 1.06% and 0.16%, respectively.[10] In our study it was found that there was no correlation between family history and refractive error.

CONCLUSION

Childhood blindness is one of the priority conditions targeted in VISION 2020: The Right to Sight Initiative of the World Health Organisation. Most of the children with uncorrected refractive error are asymptomatic and hence screening helps in early detection and timely intervention which prevents the progression of the disease and development of amblyopia which is one of the leading cause of avoidable blindness as per VISION 2020. Parents, teachers and school children should be subjected for periodic counselling and awareness programmes about identification of the disease and follow up. Focus should be given in adequate physical outdoor activities and its significance both at school and at home. Adequate education regarding avoidance of excess near work such as using cell phones, increased reading hours and watching television very closer during the developmental age should be provided as there is a peak incidence of

refractive error during that period. Engaging children to use cell phones while having food should not be encouraged. Encouraging school children to participate in skits and dramas which creates awareness regarding the adverse effects of usage of television and cell phones for long hours will help in preventing the incidence and further progression of refractive errors.

REFERENCES

[1] WHO. Global initiative for the elimination of avoidable blindness. Geneva: World Health Organization 1989. (WHO.PBL/97.61).

[2] Visual impairment and blindness Fact Sheet. Fact sheet no 282. World Health Organisation 2017.

[3] World Health Organization. International statistical classification of diseases and related health problems. 10th Revision, 2nd edn. Geneva: World Health Organization 2005.

[4] Resnikoff S, Pascolini D, Mariotti SP, et al. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull World Health Organ 2008;86:63-70.

[5] Abrams D. Duke-elder's practice of refraction. 10th edn. New Delhi: B.I. Publication Pvt Ltd 1993: P. 3.

[6] Pavithra MB, Maheshwaran R, Rani MA. A study on the prevalence of refractive errors among school children of 7-15 years age group in the field practice areas of a medical college in Bangalore. International Journal of Medical Sciences and Public Health 2013;2(3):641-645.

[7] Kalikivayi V, Naduvilath TJ, Bansal AK, et al. Visual impairment in school children in Southern India. Indian J Ophthalmol 1997;45(2):129-134.

[8] Matta S, Matta P, Dev A. Refractive errors among adolescents attending ophthalmology OPD. Indian Journal of Community Medicine 2006;31(2):114-115.

[9] Datta A, Choudhury N, Kundu K. An epidemiological study of ocular condition among school children of Calcutta Corporation. Indian Journal of Ophthalmology 1983;31(5):505-510.

[10] Padhye AS, Khandekar R, Dharmadhikari S, et al. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. Middle East Afr J Ophthalmol 2009;16(2):69-74.