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Original Research Article

Refractive errors in children attending ophthalmology clinic of a teaching institute in South India

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ABSTRACT

Objectives: To assess the prevalence of various refractive errors in children attending ophthalmology out patient department of a tertiary hospital.

Materials and Methods: 173 children with defective vision were assessed for refractive errors during June 2021- June 2022.

Results: Females accounted for the majority of children (61.6%). Most common type of refractive error was myopia (52%) followed by hyperopia (27.2%) and the least common was astigmatism(20.8%). Myopic astigmatism was the most common variety in cases of astigmatic cases(72.2%). The frequency of myopia increased with increasing age of children. This association was found to be statistically significant (p<0.01%). Mean refractive error was -1.047D. The SD was -2.57D. Low myopia was the most common (38.1%) with females being the majority of these cases (24.2%). Myopia had highest parental association among refractive errors (57.4%).

Conclusions: Refractive errors when uncorrected can lead to amblyopia and strabismus and hence school based and community based screening is necessary to get a real estimate of the burden of uncorrected refractive errors.

1. Introduction

Refractive errors are one of the most common causes of visual impairment around the world and second leading cause of treatable blindness.[1] When uncorrected, refractive errors can affect children adversely in the form of learning problems, poor performance at school lowered self-esteem, hampering of day to day activities and hence can affect future of the child. Childhood blindness and visual impairment are important and perhaps more devastating & disabling than adult onset blindness because a child spends twice the number of blind years than a person blind due to cataract.

Studies show that in India 6-7% of children in the age group of 10-15 years have refractive errors affecting their learning at school.[2] This study aims to assess the prevalence of various refractive errors in children.

2. Materials and Methods

This is a hospital based prospective study which was done in children attending ophthalmology OPD of Shadan hospital, Shadan institute of medical sciences which is a teaching institute located in south India.

2.1. Study period

June 2021 to June 2022.

2.2. Sample size

173 children who fulfilled the inclusion and exclusion criteria were included in the study.

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2.3. Ethical consideration

The study was done after getting clearance from the institutional ethics committee.

2.4. Inclusion criteria

Children aged between 5-12 years with defective vision.

2.5. Exclusion criteria

1. Children <5years and >12 years
2. Children with strabismus
3. Children with nystagmus

2.6. Data collection

An informed written consent was obtained in every case, and patients with defective vision were subjected to the following tests.

Visual acuity was tested by snellen's chart. Illiterate E and Lea symbol chart were used in pre school children. It was followed by autorefractometry and wet retinoscopy with the help of 1% cyclopentolate eye drops. The post mydriatic test was carried out on 3rd day of dilatation. The children were categorized into various refractive error subtypes depending on the power of lens that could correct the error. It was as follows:

Low hyperopia upto +2D, moderate hyperopia from +2D to +5D and high hypermetropia as >5D low myopia as <3D, moderate myopia as 3D-6D and high myopia as >6D.

A difference of 0 25D in between 2 principle meridians of the eye was considered astigmatism.

2.7. Statistical analysis

Data was entered in MS-excel and analysis was done using SPSS version 20.

Descriptive statistical analysis was done. Results on continuous measurement are represented as mean and standard deviation. Results on categorical measurements are presented as percentages.

Chi square test was used to find out the significance of study parameters on a categorical scale between 2 groups.

Paired t-test was used to find out the significance of study parameters on a continuous scale between 2 groups made under 2 different conditions.

3. Results

The present study analysed 173 children with refractive errors, aged 5-12 years without any other organic diseases of eye. It was done in the ophthalmology out patient department of Shadan hospital.

Distribution of children according to their age is presented in table 1. The majority of children that were examined were in the age group of 10-12 yrs (58.4%). The least number of children were in 5-7 yrs group (19.1%). Mean age was 9.62 years, with 95% CI of 9.31 to 9.94. The median was 10 years, with SD of 2.09. Minimum age was 5 yrs and maximum was 12 yrs.

Table 1: Age distribution of refractive errors

Age Group	Frequency	Percent
5-7years	33	19.1%
8-9 years	39	22.5%
10-12 years	101	58.4%
Total	173	100%

Table 2: Sex distribution of refractive errors

Sex	Frequency	Percent
Female	99	57.2%
Male	74	42.8%
Total	173	100%

Table 3 shows the sex distribution according to age of children, most of them being females in age group of 10-12yrs, accounting for 61.6% of the total children. The majority of males(54.1%) and females(61.6%) belonged to 10-12 years age group.

Table 3: Sex distribution of refractive errors according to age

Age group	Female	Male	Total
5-7 years	16	17	33
	16.2%	23.0%	19.1%
8-9 years	22	17	39
	22.%	23.%	22.5%
10-12 years	61	40	101
	61.6%	54.1%	58.4%

Chi square value= 1.455 p-value= 0.483 ; statistically not significant

Table 4 represents the frequency and percentage of various refractive errors in study group.the majority fell into myopia group (52%), next being hypermetropia (27.2%) and least, astigmatism accounting for 20.8% of the total refractive anomalies. Among the cases of astigmatism, majority(72.2%) belonged to myopic astigmatism group.

Table 4: Distribution of various refractive errors

Type	Frequency	Percentage
Astigmatism	36	20.8
Myopic	26	72.2
Hyperopic	4	11.1
Mixed	6	16.7
Myopia	90	52.0
Hypermetropia	47	27.2

Table 5 shows the distribution of refractive anomalies according to the sex of children with myopia and astigmatism showing predominance of females 57.6%

Table 5: Distribution of various refractive errors by sex

Refractive error	Male (%)	Female(%)	Total(%)
Myopia	33(44.6)	57(57.6)	90(52.0)
Hypermetropia	26(35.1)	21(21.2)	47(27.2)
Astigmatism	15(20.3)	21(21.2)	36(20.8)
Total(%)	74(100)	99(100)	173(100)

Chi square value = 4.411 p-value=0.110; statistically not significant

and 21.2%, respectively and 35.1% males falling into hypermetropia.

Table 6 shows distribution of refractive anomalies according to various age groups. Myopia was found to be more common in 10-12 years of age group accounting for 72.2% of all myopic children and 37.5% of all refractive errors with p-value of <0.01 which is statistically significant. Astigmatism was the least common in 5-7 (5;15.2%) and 8-9 (9;23.1%) age groups. Hypermetropia accounted for least number of refractive anomalies among 10-12 years group (14;13.9%).

Table 6: Distribution of refractive errors by age groups

Variable	Age group			Total (%)
	5 to 7 (%)	8 to 9 (%)	10 to 12 (%)	
Astigmatism	5(15.2)	9 (23.1)	22(21.8%)	36(20.8)
Myopia	6(18.2)	19(48.7)	65(64.4)	90(52.0)
Hypermetropia	22(66.7)	11(28.2)	14(13.9)	47(27.2)

Chi square value = 36.499;   p-value<0.01; Statistically significant

It shows that highest parental association rate is present in myopia (55.5%).

Table 7: Parental association in various refractive errors

Refractive error	Parental association	Percentage
Myopia	39	57.4%
Hyperopia	14	20.6%
Astigmatism	15	22.1%

Chi-square value = 2.481, p-value = 0.289 ; statistically not significant.

Mean refractive error was -1.047 with 95% CI of -1.32 to -0.77. The SD was - 2.57 with minimum value of -10.5 maximum value of 5.75 and median of -0.75.

Low myopia (<3D) was the most common (66;38.1%), with females contributing to most of them (42;24.2%). Least were children with high hypermetropia with only one male child.

4. Discussion

Screening and diagnosis of refractive abnormalities must be carried out in children from a very young age as when undetected and uncorrected they remain a significant cause of amblyopia and strabismus. It is important to timely

determine the existence, amount and difference of refractive anomalies in both eyes in this vulnerable population.

Refraction of the eye changes through-out life. During the growth of the eye, the process of emmetropization normally occurs i.e., harmonization of refractive and axial parameters and formation of emmetropic relations within normal biological variation.

Refractive errors are among the leading causes of visual impairment worldwide and are responsible for high rates of low vision and blindness in certain areas. The refractive error study in children in China[3] Chile[4] and Nepal[5] is the first multicountry population based assessment of refractive errors in children. The data reveals that there are significant and large geographic differences in the prevalence of refractive errors and that uncorrected refractive errors are very common.

Our study investigated the most common type of refractive error and its correlation with age and gender of the study population. In our study, myopia was found to be the most common refractive error (52.0%), followed by hyperopia (27.2%) and least number of cases were astigmatic (20.8%). Findings from some studies from different countries like China,[3] Chile,[4] Kenya,[6] Malawi,[7] India,[8–10] and Nepal[5] have shown similar results i.e.,myopia was the most common type of refractive error.

This consistent lower prevalence of hypermetropia in school going children is due to the emmetropization process of the eye and the children experience loss of hypermetropia after 6 to 8 yrs of age.[11,12]

Ali in Pakistan reported a positive familial history of wearing spectacles at 57% and indicates a very strong relationship between refractive errors and hereditary or familial factors.[13]

5. Conclusions

Myopia was the most common type of refractive error and there is no statistical significance of the relation between sex and type of refractive error.

1. Myopia is the most common refactive error in age group of 10-12 years and it is statistically significant.
2. Myopia had a positive parental association in more than half of cases.
3. Myopic astigmatism is the most common variety of astigmatic cases.

6. Limitations

This was a hospital based study and hence not representative of the real community and world scenario. School screening programmes and community screening has to be done in order to bring out the real picture.

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