

A STUDY ON PREVALENCE OF REFRACTIVE ERRORS, STRABISMUS AND AMBLYOPIA IN PAEDIATRIC AGE GROUP IN A TERTIARY CARE HOSPITAL

Vinodhini K¹, Anuradha T. R², Vaishnavi J³, Nazeem Farzana Ghouse⁴

¹Assistant Professor, Department of Ophthalmology, Government Stanley Medical College and Hospital, Chennai.

²Senior Assistant Professor, Department of Ophthalmology, Government Stanley Medical College and Hospital, Chennai.

³Postgraduate Resident, Department of Ophthalmology, Government Stanley Medical College and Hospital, Chennai.

⁴Postgraduate Resident, Department of Ophthalmology, Government Stanley Medical College and Hospital, Chennai.

ABSTRACT

BACKGROUND

Refractive errors are considered to be a preventable cause of blindness, leading to visual disabilities in children. As per WHO Vision 2020 initiative high priority is given for correction of refractive error as it is placed within the category of "childhood blindness". Uncorrected refractive error can result in amblyopia or strabismus. The risk of developing amblyopia occurs if the children are not screened early for refractive errors and corrected on time. Most of the children with uncorrected refractive errors are asymptomatic and screening helps in early detection and timely intervention to avoid complications. Thus, the purpose of this study was to estimate the frequency and pattern of refractive errors, and to analyse associations between refractive error and different types of strabismus and amblyopia in paediatric age group <12 years who attended our Ophthalmology OPD at Govt. Stanley Medical College Hospital located in North Chennai.

MATERIALS AND METHODS

An observational, cross sectional study was done in paediatric age group <12 years who attended the Ophthalmology OPD in our Hospital during a 1-year period, after obtaining ethical committee clearance. Informed consent was taken from the children's parent or guardian. All patients underwent a complete ophthalmic examination including a detailed history of ophthalmic problems, fundus examination, refraction, uncorrected visual acuity (UCVA), and best corrected visual acuity (BCVA). Keeping in view that accommodation may affect the result, cycloplegic refraction was done in all the children using 1% cyclopentolate. During routine ophthalmic examination of these children, the presence or absence of amblyopia and strabismus was also recorded. When strabismus was noted in children, squint evaluation was done. Based on the observations, they were grouped under the following heads: Myopia and Hypermetropia (mild/ moderate/ high), Astigmatism (mild/moderate/high).

RESULTS

Out of the 200 children, 128 (64%) were found to have refractive errors – astigmatism (49.2%) >hypermetropia (28.1%) >myopia (22.7%). 6 (4%) of them were found to have amblyopia and all of them presented late to us >7 years of age with mixed astigmatism, simple and compound hypermetropic astigmatism. 3 (2.3%) of the 128 children had strabismus – 2 esotropia and 1 exotropia, and they also presented at >7 years of age associated with hypermetropia and compound hypermetropic astigmatism.

CONCLUSION

Our study thus showed that Astigmatism was the most common refractive error among our study population and it was the most common association of amblyopia. Hypermetropia was found to be a common association of strabismus. Amblyopia and strabismus was found in children who presented to us late after 7 years of age. Hence our study on the whole signifies the need for early screening of children for refractive errors even from the pre-verbal age group to eliminate complications like amblyopia and strabismus.

KEYWORDS

Refractive Error, Amblyopia, Strabismus, Screening, Paediatric Age.

HOW TO CITE THIS ARTICLE: Vinodhini K, Anuradha TR, Vaishnavi J, et al. A study on prevalence of refractive errors, strabismus and amblyopia in paediatric age group in a tertiary care hospital. J. Evid. Based Med. Healthc. 2018; 5(8), 709-713. DOI: 10.18410/jebmh/2018/144

BACKGROUND

Refractive errors have been reported as the leading cause of visual impairment in school children worldwide. It is estimated that about 1.6 million children <12 years are visually impaired from uncorrected refractive errors in India, with a prevalence of 0.6%. This can have immediate and long term consequences in children such as poor school performance and impaired quality of life.^{1,2} Uncorrected

refractive error in the long run can lead onto amblyopia/strabismus.

A number of factors are responsible for uncorrected refractive errors like lack of awareness, inability of the child to recognize the problem etc., hence early detection of refractive errors is essential in paediatric age group.

Financial or Other, Competing Interest: None.
 Submission 01-02-2018, Peer Review 05-02-2018,
 Acceptance 17-02-2018, Published 19-02-2018.

Corresponding Author:

Dr. Anuradha T. R,
 #M18/C, Geetanjali Complex,
 15th Avenue, Ashok Nagar, Chennai- 83.
 E-mail: dranuophthal@gmail.com
 DOI: 10.18410/jebmh/2018/144



This study thus aims to estimate the frequency and pattern of refractive errors, and to analyse associations between refractive error and different types of strabismus and amblyopia in <12-year age group. This was to highlight the magnitude of paediatric refraction related problems in our community.

Aims and Objectives- The aim of our study was to estimate the prevalence of refractive errors, strabismus and amblyopia in children <12 years who attended our OPD.

The Objectives

1. To estimate the frequency and pattern of refractive errors in paediatric age group <12 years.
2. To analyse associations between refractive error and different types of strabismus in these children, to analyse associations between refractive error and amblyopia in these children.

MATERIALS AND METHODS

A cross sectional, observational study was conducted at our hospital in children <12 years age, during a 1-year study period. Informed consent was obtained from the child’s parent or guardian. All patients underwent a complete ophthalmic examination including a detailed history, UCVA, BCVA, fundus examination, cycloplegic refraction using 1% cyclopentolate. During the ophthalmic examination, the presence or absence of amblyopia and strabismus was also recorded. If Strabismus was noted, then squint evaluation was done accordingly.

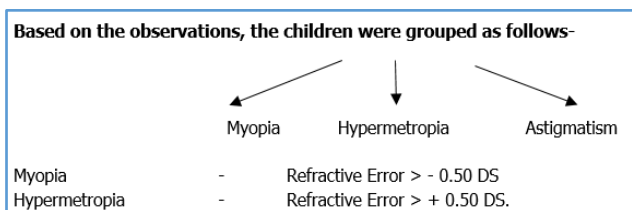


Figure 1. Grouping of Refractive Errors

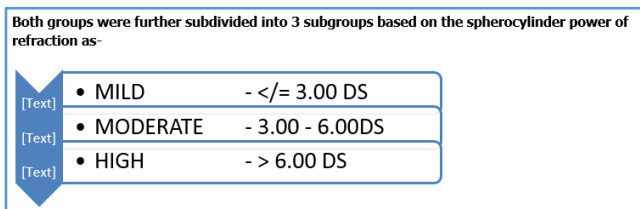


Figure 2. Subdivision Based on Spherocylinder Power

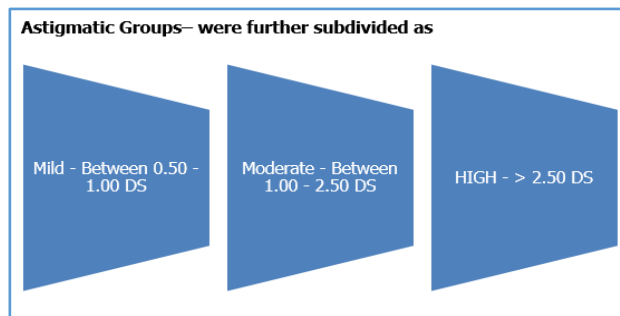


Figure 3. Subdivision of Astigmatic Groups

Inclusion Criteria

Children <12 years with defective vision, asthenopic symptoms.

Exclusion Criteria

- Children with congenital strabismus.
- Children with other pathological causes of defective vision.
- Chronic medical or mental conditions.

RESULTS

During the observed study period, a total of 200 children presented at our Ophthalmology OPD. The mean age of the children attended was 7.5 years.

Prevalence of Refractive Errors- Of the 200 children, refractive errors were present in 128 children (64%).

- Of them 63– had astigmatism (49.2%), 36 had hypermetropia (28.1%) and 29 (22.7%) – had myopia
- In the Astigmatism group, all 63 children belonged to the Mild subtype.
- In the Hypermetropia group, all 36 children belonged to the Mild subtype
- In the Myopia group, 28 children belonged to Mild subtype, 1 belonged to the Moderate subtype.

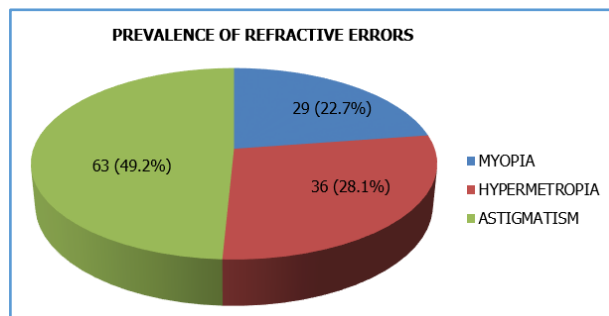


Figure 4. Prevalence of Refractive Errors

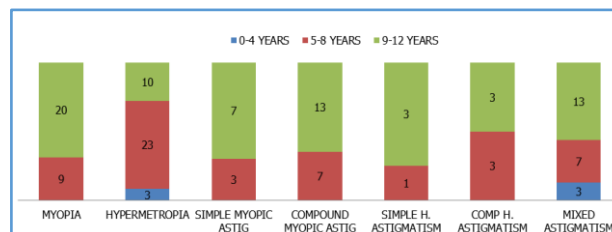


Figure 5. Age Wise Distribution of Refractive Errors

Refractive Error	0-4 Years Age	5-8 Years	9-12 Years
Myopia (29) - 22.7%	0	9	20
Hypermetropia (36) - 28.1%	3	23	10
Astigmatism (63) - 49.2%			
Simple myopic astigmatism	0	3	7
Compound myopic astigmatism	0	7	13
Simple hypermetropic astigmatism	0	1	3
Compound hypermetropic astigmatism	0	3	3
Mixed astigmatism	3	7	13

Table 1. Age Wise Distribution of Refractive Errors

Here, 69 children– belonged to 9-12 year age group, 53 children– belonged to 5-8 year age group and 6 children belonged to 0-4 year age group.

Sex Wise Distribution of Refractive Errors- Of the 200 children, 128 (64%) were found to have refractive errors of which 93 (72.6%) were male children, 35 (27.5%) were female children.

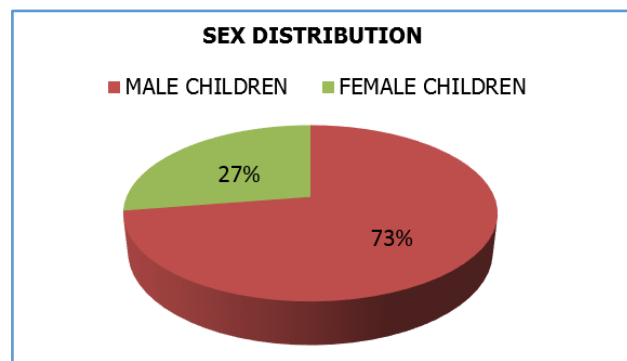


Figure 6. Sex wise Distribution

Amblyopia- Amblyopia was found out in 6 children (4%), and all of them presented after 7 years of age. None of the simple myope/ hypermetrope had amblyopia. If they had presented early for detection of refractive errors, amblyopia could have been prevented in these children. So this emphasizes the need for earlier screening of refractive errors in paediatric age

2 had mixed astigmatism, 2 - compound hypermetropic astigmatism, 2 - simple hypermetropic astigmatism.

Type of Refractive Error	Degree of Refractive Error	No. of Amblyopes	Age of Amblyopic Child
1. Myopia	-	0	-
2. Hypermetropia	-	0	-
3. Astigmatism			
4. Simple Myopic Astigmatism	-	0	-
5. Compound Myopic Astigmatism	-	0	-
6. Simple Hypermetropic Astigmatism	MILD	2	10, 11 YEARS
7. Compound Hypermetropic Astigmatism	MILD	2	11, 12 YEARS
8. Mixed Astigmatism	MILD	2	7, 8 YEARS

Table 2. Amblyopic association of Various Refractive Errors

Strabismus- Strabismus was seen in 3 children (2.3%), out of which 2 had ESOTROPIA, 1 had EXOTROPIA, and all of them presented after 7 years of age.

- Esotropes: 1 Had Hypermetropia, other – Compound Hypermetropic Astigmatism.
- Exotropia: Hypermetrope.

Type of Refractive Error	Degree of Refractive Error	Number of Children with Strabismus	Age of Child with Strabismus
Myopia	-	0	-
1. Hypermetropia	Mild Mild	2 1- Esotrope 1- Exotrope	11 years 12 years
2. Astigmatism			
3. Simple myopic astigmatism	-	0	-
4. Compound myopic astigmatism	-	0	-
5. Simple hypermetropic astigmatism	-	0	-
6. Compound hypermetropic astigmatism	Mild	1 - Esotrope	8 Years
7. Mixed astigmatism	-	0	-

Table 3. Strabismic Association of Various Refractive Errors

Type of Refractive Error	Number of Amblyopes
1. Myopia	0
2. Hypermetropia	0
3. Astigmatism	
4. Simple Myopic Astigmatism	0
5. Compound Myopic Astigmatism	0
6. Simple Hypermetropic Astigmatism	2
7. Compound Hypermetropic Astigmatism	2
8. Mixed Astigmatism	2

Table 4. Number of Amblyopes in Various Refractive Error Groups

Type of Refractive Error	Number of Strabismic Children
1. Myopia	0
2. Hypermetropia	2
3. Astigmatism	
4. Simple Myopic Astigmatism	0
5. Compound Myopic Astigmatism	0
6. Simple Hypermetropic Astigmatism	0
7. Compound Hypermetropic Astigmatism	1
8. Mixed Astigmatism	0

Table 5. Number of Strabismic Children in Various Refractive Error Groups

DISCUSSION

Refractive errors are common visual problems of childhood. Uncorrected refractive errors cause immediate and long-term problems. The WHO initiative Vision 2020 has identified uncorrected refractive errors in children as a major area which needs immediate action. Early screening of preschool and school children is an important measure to discover the magnitude of the problem and to take immediate corrective action.

The purpose of our study was to find out the frequency and pattern of refractive errors and their associations with strabismus and amblyopia in children <12 years of age attending our OPD.

This study showed that 128 (64%) out of 200 children who presented to our OPD had refractive errors. The distribution of subtypes of refractive errors show that astigmatism (49.2%) was more prevalent than hypermetropia (28.1%) and myopia (22.7%). Astigmatism was found in 63 children, Hypermetropia was found in 36 children and Myopia was found in 29 children. This is in contrast to other studies.

-1. Ali A, Ahmed I, Ayub S et al., 2. Pokharel A, Pokharel PK, Das H, Adhikari S et al., in which Myopia was the predominant type of refractive error.^{3,4,5} This may be attributed to our sample selection criteria– hypermetropia and astigmatism are the refractive errors commonly prone for amblyopia, our study showed an increased prevalence of these refractive errors, thus screening of the paediatric age group earlier could decrease the incidence of amblyopia.

In this study, the mean age of children was 7.5 years. 69 of these children were in the 9-12 year age group, 53 were between 5-8 years age group and 6 of the children were in 0-4 years age group. This may be attributed to the fact that school going children were the majority to attend our Ophthalmology OPD, as they could verbally express their

symptoms like difficulty in vision. Hence this signifies that the screening of refractive errors even from the pre- verbal period in paediatric age group is a must.

The refractive errors were distributed more in male children (93 males– 72.5%) than in females (35 females – 27.5%).

A significant hypermetropic error or ocular misalignment presenting during the critical period of visual development (from birth to the age of seven) will lead to development of amblyopia.⁶ The prevalence of amblyopia was 4% in our study and was found in 6 children. The majority of amblyopic children had hypermetropic astigmatism (4 children – 2 had simple hypermetropic and 2 had compound hypermetropic astigmatism). All the 6 amblyopic children presented after 7 years of age. This could have been prevented if screening of paediatric age group was done in these children at an earlier age thus emphasizing the need for early screening of refractive errors.

The ocular deviation associated with refractive error was 2.3% (3 out of 128 children). All the 3 children who presented with strabismus presented after 7 years of age and had either hypermetropia/ hypermetropic astigmatism. Hence this shows that late presentation for consultation may lead to development of complications like amblyopia and strabismus.

These findings are consistent with findings from other studies - Robaei D, Rose KA, Ojaimi E et al, Ingram RM, Walker C, Wilson JM et al, Sjostrand J, Abrahamsson M et al that described a strong association of hyperopic refraction with strabismus and amblyopia.^{7,8,9}

The explanation for increased association of esotropia with hypermetropia more than myopia can be physiological phenomena.¹⁰ That is, the accommodation required by the hyperopic child to focus an image on the retina stimulates

convergence. Esotropia develops when fusional divergence is insufficient to compensate for this. Patients with uncorrected hypermetropia may also present with exotropia due to poor accommodation and deficient convergence.

CONCLUSION

Our study thus showed that astigmatism was the most common refractive error among our study population and it was the most common association of amblyopia. Hypermetropia was found to be a common association of strabismus. Amblyopia and strabismus was found in children who presented to us late after 7 years of age.

This study hence validates the implementation of fundamental guidelines including promotion of parent education regarding early screening of their children (starting from the pre-verbal age) for refractive errors, strabismus and amblyopia. Periodic eye camps also need to be organized regularly among school going children to identify these errors and to prevent complications.

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