

## Pattern of Refractive Errors in Children in a Rural Setting

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| Received: 09.02.2019 | Accepted: 18.02.2019 | Published: 28.02.2019

DOI: [10.36347/sjams.2019.v07i02.063](https://doi.org/10.36347/sjams.2019.v07i02.063)

### Abstract

### Original Research Article

**Purpose:** To assess the pattern of refractive errors in children visiting to tertiary hospital in rural area of Punjab. **Settings and Design:** Single institutional, collaborative and retrospective study. **Materials and Methods:** Children of both genders aged 3 to 16 years attending the eye OPD after being referred from pediatric OPD of a tertiary care teaching hospital in rural area of malwa region, underwent visual acuity assessment, ocular motility evaluation and cover uncover test. Children with defective vision were further examined employing objective refraction using autorefractometer followed by streak retinoscopy after instilling 1% cyclopentolate eye drops. Children with any kind of refractive errors were evaluated and categorized according to the type of refractive error on post mydriatic examination. **Results:** The pattern of refractive error in children who were referred from the Department of Pediatrics was studied. There was no significant difference in the percentage of refractive error between males and females. The single most common refractive error was astigmatism followed by myopia and then hypermetropia. **Conclusions:** Refractive error is one of the leading causes of treatable blindness in school age children. Collaborative approach between the paediatricians and ophthalmologists could play a key role in the timely diagnosis and treatment of refractive errors in children to meet the challenges of treatable blindness. **Keywords:** refractive error, myopia, hypermetropia, astigmatism.

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## INTRODUCTION

Childhood blindness refers to a group of diseases and conditions occurring in childhood or early adolescence which if left untreated results in severe blindness or some visual impairment that are likely to be untreatable later in life [1, 2]. World Health Organization (WHO) defined blindness as a visual acuity less than 3/60 or a corresponding visual field loss of less than 10 degrees in the better eye with the best possible correction [3].

Childhood visual impairment due to uncorrected refractive errors is one of the most common problems in school age children and is the second. Leading cause of treatable blindness [4]. Uncorrected refractive errors are responsible for upto 42% of the cases of visual impairment worldwide [5].

Poor vision and an inability to read material on the chalkboard due to refractive error can profoundly affect a child's participation and learning in the classroom and finally affects his self-confidence.

Uncorrected refractive error has significant economic implications in terms of potential lost productivity in both developed and developing countries. Approximately 12.8 million children in the age group 5-15 years are visually impaired from uncorrected or inadequately corrected.

refractive errors, estimating a global prevalence of 0.96%.<sup>6</sup>So, this condition has been considered one of the priorities of Vision 20-20 -The right to sight, a global initiative launched by a coalition of non-government organizations and the World Health Organization.

This study aims at collaborative approach between paediatrician and ophthalmologists in teaching tertiary hospital in rural area to decrease the burden of treatable blindness.

## MATERIALS AND METHODS

This was retrospective collaborative observational study conducted in Department of Paediatrics and the Department of Ophthalmology of a

medical college in malwa region of Punjab. The study period was 6 months, from July 2017 to July 2018. All children 3-14 years of age, reporting to the department of Ophthalmology after being referred from the Department of Paediatrics were included in the study.

A total of 175 children were enrolled in the study after taking written informed consent from the guardians. The study protocol was approved by the Local and Institutional Ethics Committee. The children were divided into three groups: Preschool (3-5), school going (6-9 years), and older (10-14 years) children for studying pattern of refractive error in different pediatric age groups.

After taking consent from the guardians, the preliminary data such as name, age, sex, residence, educational status, and residential area were recorded first. Detailed visual acuity testing and refraction was done for all children by the senior optometrist. Presence of amblyopia was noted. Detailed anterior segment examination was done by both torchlight and slit lamp by the consultant ophthalmologist. This information was retrieved by methods of examination such as visual acuity testing by Snellen test for school going children and by preferential looking system for younger children, refraction (subjective, objective and cycloplegic), slit lamp examination, Extraocular movements, cover test and convergence test using RAF rule and funduscopy. Inclusion Criteria included only refractive error. Children having any other systemic illness or other ocular problem or previous ocular

surgery or any other cause of diminution of vision were excluded. Children with uncorrected visual acuity 20/20 were also excluded. The whole data were then analysed in detail. After examination patients were provided treatment accordingly and those who need further evaluation were called for follow up.

The children with any type of refractive errors on post mydriatic examination were further evaluated according to the type of refractive error.

A spherical equivalent of -0.5 diopter (D) or more was defined as myopia, +1D or more was defined as hypermetropia, and a cylinder refraction greater than 0.75D was considered as astigmatism.

### RESULTS AND DISCUSSION

A Total of 175 children between 3-14 years were included in the study. Out of these, 83(47.42%) were males and 92(52.57%) were females. MALE TO FEMALE RATIO IS ---(Table 1). Myopia was found to be slightly more common in females (19.42%,n-34), males (15.42%,n-27). Hypermetropia was found equal in both males and females i.e thirteen (7.42%). Myopic astigmatism was more common in females (17.14%,n-30) whereas males were 12.57% (n-22) followed by hypermetropic astigmatism n followed by mixed astigmatism. Hypermetropic astigmatism was more in males (7.42%, n-13), in females (5.71%, n-10). Mixed Astigmatism was found in eight (4.75%) males and five (2.85%) females.

**Table-1: Sex Distribution of children with Type of Refractive Error**

Type of refractive error	Male N(%)	Female N(%)	Total
Myopia	27(15.42%)	34(19.42%)	61(34.85%)
Hypermetropia	13(7.42%)	13(7.42%)	26(14.85%)
Hypermetropic Astigmatism	13(7.42%)	10(5.71%)	23(13.14%)
Myopic Astigmatism	22(12.57%)	30(17.14%)	52(29.71%)
Mixed	8(4.75%)	5(2.85%)	13(7.42%)
	83(47.42%)	92(52.57%)	175

Table 2 shows the pattern of refractive error with different age group. Myopia was found 48 children (27.42%) in the age group (10-14), 11 children (6.28%) and 2 child in age group (3-5). Hypermetropia was found in 12 children (6.85%) in age group (10-14), five (2.85%) in age group (6-9) and nine (5.14%) in 3-5 age group. Myopic astigmatism was more in 10-14 age group (n-30, 17.14%), followed by 6-9 age group (n-16, 9.14%) and in age group 3-5 in 6 children (3.42%).

Hypermetropic astigmatism found in nine children (5.14%) in age group 10-14, eight (4.75%) in 6-9 age group and six (3.42%) in 3-5 age group. Mixed Astigmatism was seen more in the age group 3-5 (n-8,4.75%), in 10-14 age group (n-3,1.71%) and 6-9 age group (n-2,1.14%). Out of 175 children in the study group 102(58.28%) were in the age group of 10-14 years, 42 children (24%) in 6-9 years age group and 31 children (17.71%) in the age group of 3-5 years.

**Table-2: Age Distribution of children with Type of Refractive Error**

Type of refractive error	<5 years	6-9 years	10-14 years	Total
Myopia	2(1.14%)	11(6.28%)	48(27.42%)	61(34.85%)
Hypermetropia	9(5.14%)	5(2.85%)	12(6.85%)	26(14.85%)
Hypermetropic Astigmatism	6(3.42%)	8(4.75%)	9(5.14%)	23(13.14%)
Myopic astigmatism	6(3.42%)	16(9.14%)	30(17.14%)	52(29.71%)
Mixed	8(4.75%)	2(1.14%)	3(1.71%)	13(7.42%)
	31(17.71%)	42(24%)	102(58.28%)	175

Table 3 shows the magnitude of refractive error with the type of refractive error. Forty six children (26.28%) had myopia of 1D-3 D, fifteen children had myopia of 4D-6D. Eighteen children (10.28%) had Hypermetropia of 1-3D, Seven (4%) had hypermetropia of 4D-6D, only one child had 10D of Hypermetropia. Myopic Astigmatism of 1D-3 D was found in 35 children (20%), of 4D-6D in thirteen (7.42%), one case had 7D and three cases had more than 10D. Hypermetropic Astigmatism of 1D-3D I sixteen

cases(9.14%), of 4D-6D in five cases(2.85%) and one child had 7D and one child had 10D. Mixed Astigmatism A stigmatism of 1-3 D was found in nine children(5.14%), two children had 4D to 6D ,one child had 8D and one child had 10 D. 124 children(70.85%) had 1-3 D of refractive error, 42 children 24% had refractive error of 4D-6D ,three children(1.71%) had refractive error of 7D-9D and six(3.42%) had refractive error of 10D.

**Table-3: Magnitude of Refractive error with Type of Refractive Error**

Type of refractive error	1D-3D	4D-6D	7D-9D	>=10D	Total
Myopia	46(26.28%)	15(8.57%)	-	-	61(34.85%)
Hypermetropia	18(10.28%)	7(4%)	-	1(0.57%)	26(14.85%)
Hypermetropia Astigmatism	16(9.14%)	5(2.85%)	1(0.57%)	1(0.57%)	23(13.14%)
Myopic astigmatism	35(20%)	13(7.42%)	1(0.57%)	3(1.71%)	52(29.71%)
Mixed	9(5.14%)	2(1.14%)	1(0.57%)	1(0.57%)	13(7.42%)
	124(70.85%)	42(24%)	3(1.71%)	6(3.42%)	175

In our study refractive errors were more common in girls than boys. Pavitra *et al.* study showed similar results and their results were statistically significant but Kashmir and Ahmadabad study showed non-significant results [7].

In our study, refractive errors were more in the age group 10-14 years(58.28%) which is similar to Pavitra *et al.* study which shows that refractive errors prevalence were found more common in the 13-15 years age group compared with 7-9 years age group. This is the only study which studied the children who were first referred by the paediatrician, thus in meeting the challenges of childhood blindness; paediatrician can play a significant role. In 9 patients who have refractive error more than 7D were found to have family history of glasses. Three patients with hypermetropia had amblyopia were advised occlusion and were advised to have regular follow up. Counselling of the parents was done to have regular follow up of their child strictly.

**CONCLUSION**

Refractive error is one of the leading causes of treatable blindness in school age children. Collaborative approach between the paediatricians and ophthalmologists could play a key role in the timely diagnosis and treatment of refractive errors in children to meet the challenges of treatable blindness. Every child should have screening check for any refractive error at age of 1 year, 3 year and 5 years and yearly after that.

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