

# Prevalence of Refractive Errors among the School going Children at a Tertiary Center of West Bengal

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## Abstract

**Background:** Refractive error is an avoidable cause of visual impairment. Diagnosis and treatment of refractive errors are not only simple but also the most effective forms of eye care.

**Aims and Objectives:** To study the prevalence of refractive errors, among school children in the age group of 5-15 years.

**Material and Methods:** The study was a cross-sectional study comprising 1840 government school children in the age group of 5-15 years in the Outpatients Department of R. G. Kar Medical College, after screening during the period of October 2014 to September 2015. Students were screened for defective vision with the help of Snellen's chart. Students with refractive errors underwent retinoscopy under cycloplegia followed by post mydriatic test. Corrective glasses were prescribed and provided free of cost.

**Results:** A total of 1840 children were examined. Of which 53.6% of the study population were boys and 46.4% were girls. The mean age of the study group was 12.4 years. 48.5% of the children were in the age group of 13-15 years. 44.4% of the refractive error was detected in children studying in class 8, 9, and 10. The prevalence of refractive error in our study population was 13.86%. Urban and rural children were 7.03%. Myopia was noted to be the most common refractive error followed by hypermetropia and astigmatism. It was also noted in our study that the prevalence of refractive error was more common in the female children. It was also noted that there was a relationship between family history of parents or siblings having refractive errors.

**Conclusion:** The prevalence of uncorrected refractive error, especially myopia, was higher in older children. Causes of higher prevalence and barriers to refractive error correction services should be identified and addressed. Eye screening of school children is recommended and is a must.

**Key words:** Hypermetropia, Prevalence, Myopia, Refractive error, School Children

## INTRODUCTION

Refractive error is the second largest cause of treatable blindness after cataract.<sup>1</sup> A person becoming blind due to an uncorrected refractive error at a young age would suffer many more years of blindness than a person becoming blind due to cataract in old age and would place a greater socioeconomic burden on society.<sup>2</sup>

Refractive error as a cause of blindness has not received much attention because many definitions of blindness have been based on best-corrected distance visual acuity, including the definition used in the International Statistical Classification of Diseases and Related Health Problems.<sup>3</sup> Because of the increasing realization of the enormous need for correction of refractive error worldwide, this condition has been considered one of the priorities of the recently launched global initiative for the elimination of avoidable blindness: Vision 2020 - The Right to Sight.<sup>4,5</sup> In India, the overall incidence of refractive errors has been found to vary between 21% and 25% of the patients attending eye outpatient department.<sup>6</sup> The various studies conducted in different part of India had reported the prevalence of refractive

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errors between 20% and 25% among school going children.<sup>7</sup> There is no available data from West Bengal depicting the prevalence of refractive error among the school going children. This necessitated to conduct the study to find out the prevalence of refractive error in a tertiary center of West Bengal to assess the magnitude of the problem, so that effective rehabilitative measures can be instituted up to the optimal level to achieve the goal of the World Health Organization and International Agency for the prevention of blindness concerning to refractive error.<sup>7</sup>

## MATERIALS AND METHODS

The study was conducted in tertiary care eye center of Kolkata from a period of October 2014 to September 2015. There was a random selection of 1840 children from eight schools of North Kolkata aged 5-15 years studying in Class 1 to Class 10. All subjects were brought to the Outpatient Department of Ophthalmology at R. G. Kar Medical College, Kolkata. It was a prospective study, cross-sectional in design.

The parameters studied were:

- Visual acuity measurement with Snellen's chart.
- Gross examination of the anterior segment with a torch light.
- Streak retinoscopy and refraction.
- Cycloplegic refraction.
- Examination of media and fundus by direct ophthalmoscopy.

### Study Technique

We randomly selected eight schools of North Kolkata where screening of school children for refractive error was conducted after taking written permission to do the study from the headmaster/headmistress and informed consent from the parents. Ophthalmic examinations were carried out in the respective schools by a single ophthalmologist with the help of a departmental optometrist. Children whose visual acuity was <6/9 underwent subjective refraction till the achievement of best corrected visual acuity. Those not achieving best corrected visual acuity following subjective refraction was underwent cycloplegic refraction.

### Inclusion Criteria

School children of age 5-15 years of the randomly selected eight schools in North Kolkata.

### Exclusion Criteria

Students having corneal opacity and cataract were excluded.

## RESULTS AND DISCUSSION

Out of 1840 children in the study group 182 (9.9%) were in the age group of 5-6 years, 307 (16.7%) were in the age group of 7-9 years, 458 (24.9%) were in the age group of 10-12 years, and 893 (48.5%) were in the age group 13-15 years (Table 1 and Figure 1).

In the present study of school children, 986 (53.6%) were male and 854 (46.4%) were female children (Table 2 and Figure 2).

In this study population, 810 (44%) children were in 8<sup>th</sup>-10<sup>th</sup> standard, 289 (15.7%) were in 6<sup>th</sup>-7<sup>th</sup> standard, and

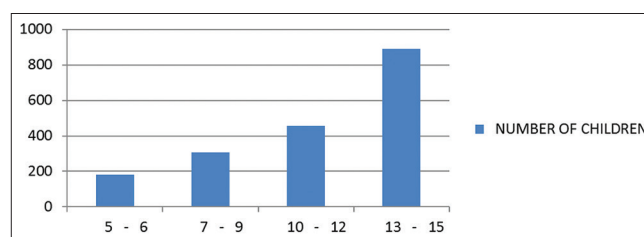


Figure 1: Distribution of the study population according to the age

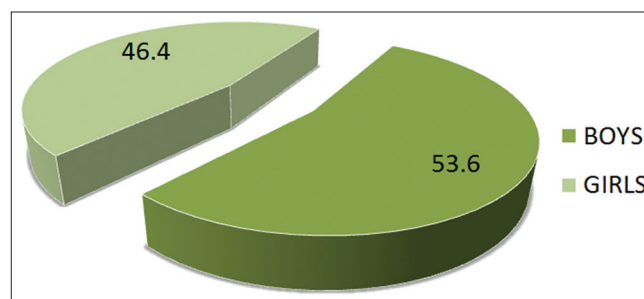


Figure 2: Distribution of the study population according to the gender

Table 1: Distribution of the study population according to the age

Age in years	Number of children (%)
5-6	182 (9.9)
7-9	307 (16.7)
10-12	458 (24.9)
13-15	893 (48.5)
Total	1840 (100.0)

Table 2: Gender wise distribution of the study population

Gender	Number of children (%)
Boys	986 (53.6)
Girls	854 (46.4)
Total	1840 (100.0)

558 (30.3%) were from 3<sup>rd</sup> to 5<sup>th</sup> standard, and 183 (9.9%) were from 1<sup>st</sup> to 2<sup>nd</sup> standard (Table 3 and Figure 3).

The visual acuity noted by investigator was found to be 6/6 in 1554 (84.45%) cases, 6/9 in 184 (10.0%), 6/12 in

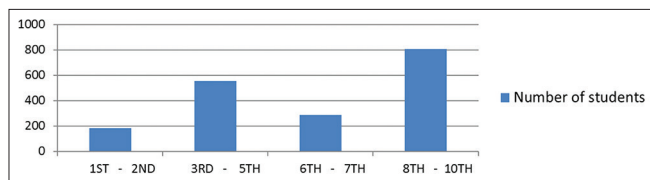


Figure 3: Distribution of students according to classes

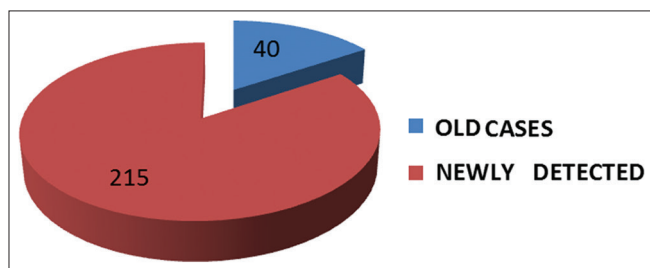


Figure 4: Distribution of newly detected and old cases of refractive errors in the study group

Table 3: Distribution of the study population according to the educational standard

Standard	Number of Children (%)
1 <sup>st</sup> -2 <sup>nd</sup>	183 (9.9)
3 <sup>rd</sup> -5 <sup>th</sup>	558 (30.3)
6 <sup>th</sup> -7 <sup>th</sup>	289 (15.7)
8 <sup>th</sup> -10 <sup>th</sup>	810 (44.4)
Total	1840 (100.0)

Table 4: Uncorrected visual acuity of children during screening using Snellen's chart

Vision by investigator	Number of children (%)
6/6	1544 (84.45)
6/9	184 (10.0)
6/12	74 (4.0)
6/18	15 (0.8)
6/24	8 (0.4)
≤6/36	5 (0.3)
Total	1840 (100.0)

Table 5: Newly detected cases and old cases of refractive errors in the study group (n=255; Figure 4)

Cases	Number of children (%)
Old case	40 (15.7)
Newly detected	215 (84.3)
Total	255 (100.0)

74 (4.0%), 6/18 in 15 (0.8%), 6/24 in 8 (0.4%), and ≤6/36 in 5 (0.3%) cases, respectively (Table 4).

Number of students examined = 1840.

Number of cases detected by the investigator = 286.

Number of cases confirmed by the refractionist = 255.

The prevalence of refractive errors in the study population = 13.86%.

In this study, out of 255 children confirmed by the refractionist with refractive errors, 215 new cases of refractive errors were found, and 40 children were already wearing spectacles (Table 5).

The age wise distribution of the prevalence of refractive error was calculated. There was 24 (13.2%) in 5-7 years, 43 (14.0%) in 7-9 years, 62 (13.5%) in 10-12 years, and 126 (14.1%) in 13-15 years, respectively (Table 6).

In this study, refractive error was more prevalent in the female children 148 (17.3% of total female children) compared to male children 107 (10.9% of total male children) (Table 7).

Among 286 children with visual acuity <6/6, 255(13.86%) children were confirmed to have a refractive error after proper check up at the hospital, and the rest 31 children were excluded from the study.

Table 6: Age wise distribution of students with and without refractive errors

Age in group	Refractive error present	Refractive error absent	Total
5-7	24 (13.2)	158 (86.8)	182
7-9	43 (14.0)	264 (86.0)	307
10-12	62 (13.5)	396 (86.5)	458
13-15	126 (14.1)	767 (85.9)	893
Total	255 (13.86)	1585 (86.14)	1840 (100)

Table 7: Gender wise distribution of refractive errors

Sex	Refractive error present	Refractive error absent	Total
Male	107 (10.9)	879 (89.1)	986
Female	148.73	706 (82.7)	854
Total	255 (13.86)	1585 (86.14)	1840

Table 8: Distribution of refractive errors as per educational standard

Standard	Refractive error present	Refractive error absent	Total
1 <sup>st</sup> -2 <sup>nd</sup>	20 (10.9)	163 (89.1)	183
3 <sup>rd</sup> -5 <sup>th</sup>	45 (8.1)	513 (91.9)	558
6 <sup>th</sup> -7 <sup>th</sup>	58 (20.1)	231 (79.9)	289
8 <sup>th</sup> -10 <sup>th</sup>	132 (16.3)	678 (83.7)	810

**Table 9: Distribution of refractive errors as per family history**

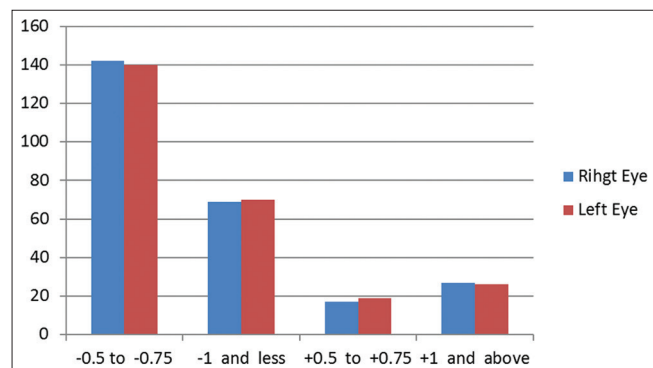
Family history	Children with refractive error	Children without refractive error	Total
Present	107	103	210
Absent	148	1482	1630
Total	255	1585	1840

**Table 10: Distribution of cases according to power in the right and left eye**

Power in diopter	Right Eye	Left eye
-0.5-0.75 days	142 (55.6)	140 (54.9)
1.00 days and above	69 (27.1)	70 (27.4)
+0.50-+0.75 days	17 (6.7)	19 (97.5)
+1.00 days or above	27 (10.6)	26 (10.2)
Total	255 (100)	255 (100)

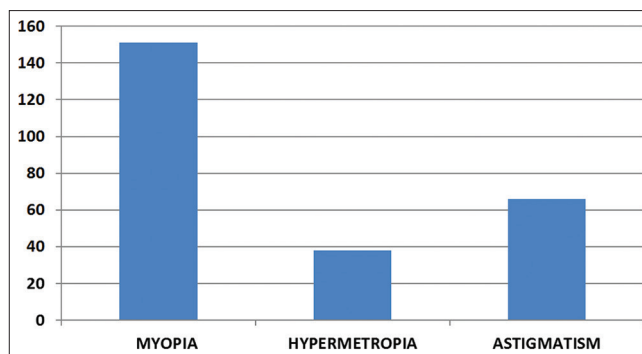
**Table 11: Distribution of refractive errors among cases and types of refractive error**

Type of refractive errors	Number of children	Percentage among the cases	Percentage in the study group
Myopia	151	59.4	8.2
Hypermetropia	38	14.8	2
Astigmatism	66	25.8	3.66
Total	255	100	13.86



**Figure 5: Distribution of cases according to power in the right and left eye**

This study shows that highest prevalence (20.1% of total children in Class 6<sup>th</sup> and 7<sup>th</sup> standard) of refractive errors in children of class 6<sup>th</sup> and 7<sup>th</sup> standard. The prevalence in children of Class 8<sup>th</sup>-10<sup>th</sup> standard is 16.3% of total children in Class 8<sup>th</sup>-10<sup>th</sup> standard, in 1<sup>st</sup>-2<sup>nd</sup> is 10.9% of total children in Class 1<sup>st</sup>-2<sup>nd</sup> standard, and 3<sup>rd</sup>-5<sup>th</sup> is 8.1% of total children in Class 3<sup>rd</sup>-5<sup>th</sup> standard (Table 8).



**Figure 6: Distribution of refractive errors among cases and types of refractive errors**

There was an association between family history of parents or siblings wearing spectacles and refractive errors. The difference in the proportion of student with a refractive error with and without family history (Table 9).

The present study shows the power of right and left eyes in diopters. Majority of the children (55.6% and 27.1%) had power of -0.5 or -0.75 days in the right and left eye. Very few children (6.7% and 10.6%) had power of +0.5 or +0.75 days in the right and left eye, respectively. The percentage of children with power less than -1.0 and above +1.0 is 27.1% and 10.6%, respectively (Table 10 and Figure 5).

In this study, myopia was more commonly seen which constitutes for 59.4% of the refractive errors. Astigmatism was seen in 25.8% of the cases which includes myopic and hyperopic astigmatism, and hypermetropia is seen in 14.4% of myopic and hyperopic astigmatism, and hypermetropia is seen in 14.8% of the cases (Table 11 and Figure 6).

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