

# Prevalence of refractive errors among school children in a rural setting

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## Abstract

**Introduction:** Uncorrected refractive errors are a common problem in school aged children. The presence of refractive error in school going children affects their physical, mental and behavioral development as well. Inability to detect them at an early stage can adversely impact their learning and academic performance. **Materials and Methods:** A school based cross sectional study was conducted in 8 randomly selected government schools during November 2012 to August 2014. Children in the age group of 10 to 15 years studying from 5<sup>th</sup> to 10<sup>th</sup> standard were screened for refractive errors. Visual acuity for distance vision (6 metres) was tested with Snellen's chart and near vision (33 cms) under day light illumination. **Results:** A total of 3174 school children in the age group of 10 to 15 years studying from 5<sup>th</sup> to 10<sup>th</sup> standard were screened. Among them 52.8% were males and 47.2% females. The total prevalence of refractive errors was found to be 6.49%. Myopia was found to be the most common pattern of refractive error among school children. The proportion of uncorrected refractive errors in the present study was 63.1%. **Conclusion:** The study concludes that most of the children were unaware of their problem contributing to a high prevalence of undetected refractive errors.

**Keywords:** Prevalence, Refractive error, School children.

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## INTRODUCTION

Refractive errors have been considered as one of the priorities of the WHO global initiative for the elimination of avoidable blindness: VISION 2020 — The Right to Sight<sup>1,2</sup>. Refractive error is defined as a state of refraction, when parallel rays of light coming from infinity are focused either in front or behind the retina after passing through the diopteric power of the eye when the accommodation is at rest<sup>3</sup>. Studies conducted in various developing countries have revealed that uncorrected refractive error is the second leading cause of treatable

blindness and the primary cause of visual disability among children in the world today<sup>4-6</sup>. Treatable refractive error is the major cause (33.3%) of the blindness in children, followed by preventable causes (16.6%) like vitamin A deficiency and post cataract surgery amblyopia<sup>7</sup>. Presence of uncorrected refractive error in children can lead to amblyopia. The presence of refractive error in school going children affects their physical, mental and behavioral development as well<sup>8</sup>. Uncorrected refractive error is a major public health problem in urban school-aged children in India<sup>9</sup>. Refractive errors have been listed, along with cataract, trachoma, onchocerciasis and childhood blindness, among eye problems whose prevention and cure should provide enormous savings and facilitate societal developments<sup>10</sup>. School aged children fall in the preventable blindness age group, and are easily accessible and schools are the best forum for imparting health education to the children. The importance of early detection and treatment of ocular morbidity and visual impairment in young children is obvious<sup>11</sup>. They must be adequately screened for early detection of eye diseases and prevention of blindness. School eye health services are a useful approach for detection of the eye health

problems in the community. Hence the present study was conducted with an objective to know the prevalence and patterns of refractive errors, their early identification and correction, and provide health education regarding vision care among school children.

## MATERIALS AND METHODS

The present study was a cross sectional study conducted in 8 randomly selected government schools during November 2012 to August 2014 after obtaining approval from the Institutional Ethics committee. All school children who were present on the day of visit were included in the study. A total of 3174 school children in the age group of 10 to 15 years studying from 5<sup>th</sup> to 10<sup>th</sup> standard were screened for refractive errors. Permission was obtained from the principals of the concerned schools for examination of the school children. After collecting the preliminary data like name, age, class etc. each student was subjected to visual acuity tests with the help of physical trainer / class teacher. Students with visual acuity of less than 6/9 were subjected to detailed examination including retinoscopy and fundus examination. Students absent on the day of visit and those apprehensive about the procedures were excluded from the study.

### Method of Examination

Visual acuity both for distance vision (6 meters) and near vision (33 Cms) was tested with Snellen's chart under day

light illumination. Children wearing spectacles were tested both with and without glasses. Near vision test with standard near vision chart was carried out at a distance of 33 Cms. Children with visual acuity 6/9 or less were examined in detail.

### Examination of the refractive state of the eye

After determining the visual acuity of each eye with and without glasses, children with visual acuity of 6/9 or less were reassessed. Children with pinhole improvement were subjected to cycloplegic refraction. Children without improvement were further examined for the presence of any ocular pathology. Children who could not read any of the lines of Snellen's chart and without pinhole improvement were listed as doubtful amblyopias and advised referral for further evaluation. After cycloplegia and objective refraction in a semi dark room, the amount and different patterns of refractive errors were estimated. Myopia, hypermetropia and astigmatism in either or both eyes equal to or more than absolute value of 0.5 D were considered for the analysis of data to find out the prevalence of refractive errors in school children. Subjective verification and correction of objective refractive findings as post cycloplegic test was done to estimate the prevalence of significant refractive errors at a tertiary hospital on a specified day. Final prescriptions of glasses were given to those children with significant refractive error, after refinement of subjectively verified readings.

## RESULTS

A total of 3174 school children in the age group of 10 to 15 years studying from 5<sup>th</sup> to 10<sup>th</sup> standard were screened for refractive errors. Among them males were 1676 (52.8%) and females 1498 (47.2%). Myopia was found to be the most common pattern of refractive error among school children. (Table I)

**Table 1:** Distribution of different types of Refractive errors

| Type of Refractive error | No. of students with Refractive error (%) |
|--------------------------|---|
| Myopia                   | 148 (71.85)                               |
| Hypermetropia            | 26 (12.62)                                |
| Astigmatism              | 32 (15.53)                                |
| <b>Total</b>             | <b>206 (100)</b>                          |

There was a gradual increase in the prevalence of refractive errors from 10-15 years and it was statistically significant. The prevalence of refractive errors was slightly higher among females, but the difference was not statistically significant ( $\chi^2 = 0.16$ ,  $p > 0.05$ ) (Table II).

**Table 2:** Distribution of refractive errors by age and sex

| Age in years | No. of children examined |             | No. of children with refractive errors |                   |
|--------------|--------------------------|-------------|--|-------------------|
|              | Male                     | Female      | Male (%)                               | Female (%)        |
| 10           | 130                      | 142         | 4 (3.08)                               | 4 (2.81)          |
| 11           | 138                      | 154         | 8 (5.78)                               | 6 (3.90)          |
| 12           | 338                      | 284         | 14 (4.14)                              | 20 (7.04)         |
| 13           | 344                      | 342         | 26 (7.56)                              | 24 (7.02)         |
| 14           | 392                      | 314         | 24 (6.12)                              | 22 (7.01)         |
| 15           | 334                      | 262         | 30 (8.98)                              | 24 (9.16)         |
| <b>Total</b> | <b>1676</b>              | <b>1498</b> | <b>106 (6.32)</b>                      | <b>100 (6.68)</b> |

( $\chi^2 = 15.31$ ;  $p < 0.05$ )

The prevalence of myopia among school children was higher in 13-15 years age group (81.09%) in comparison with 10-12 years (18.91%) and this difference was statistically significant (Table III).

**Table 3: Distribution of myopia by age and sex**

| <b>Age group (years)</b> | <b>Males</b> | <b>Females</b> | <b>Total (%)</b> |
|--------------------------|--------------|----------------|------------------|
| 10-12                    | 10           | 18             | 28 (18.91)       |
| 13-15                    | 66           | 54             | 120 (81.09)      |
| <b>Total</b>             | <b>76</b>    | <b>72</b>      | <b>148 (100)</b> |

( $\chi^2=3.38$ ;  $p<0.05$ )

Over all prevalence of hypermetropia was found to be 12.62 %. (Table IV) Hypermetropia was higher in children < 12 years of age (8.73%) compared to children > 12 years (3.88%).

**Table 4: Distribution of Hypermetropia by age**

| <b>Age (years)</b> | <b>Students with refractive errors</b> | <b>Students with Hypermetropia (%)</b> |
|--------------------|--|--|
| 10                 | 8                                      | 6 (2.91)                               |
| 11                 | 14                                     | 4 (1.94)                               |
| 12                 | 34                                     | 8 (3.88)                               |
| 13                 | 50                                     | 4 (1.94)                               |
| 14                 | 46                                     | 2 (0.97)                               |
| 15                 | 54                                     | 2 (0.97)                               |
| <b>Total</b>       | <b>206</b>                             | <b>26 (12.62)</b>                      |

Astigmatism was found to be slightly more among female children compared to that of male children. Among refractive errors the prevalence of astigmatism is found to be 15.53%.

**Table 5: Break-up of astigmatism into further groups**

| <b>Type of Astigmatism</b> | <b>No. of children (%)</b> |
|----------------------------|----------------------------|
| Simple myopic              | 18 (56.25)                 |
| Compound myopic            | 8 (25.0)                   |
| Simple hypermetropic       | 4 (12.5)                   |
| Compound hypermetropic     | 2 (6.25)                   |
| <b>Total</b>               | <b>32 (100)</b>            |

It was observed that simple myopic astigmatism with 56.25% has the highest prevalence followed by compound myopia astigmatism with 25% prevalence.

## DISCUSSION

A total of 3174 school children aged 10 to 15 years were screened for refractive errors out of which, 52.80% were males and 47.20% were females. The total prevalence of refractive errors was found to be 6.49% (myopia 4.66%, hypermetropia 0.82% and astigmatism 1.01%). This prevalence was almost similar to that observed in studies done among school children in Bangalore<sup>6</sup>, Delhi<sup>9</sup>. A slightly higher prevalence was reported by studies done in Kolkata<sup>12</sup> (4.03%), Tirupati<sup>13</sup> among school going girls (4.7%) and from schools in Ladakh among children aged 15 years or younger (5.69%)<sup>14</sup>. The prevalence of refractive errors in the present study was much lower when compared to earlier studies done in Haryana<sup>15</sup> by Seema *et al* (13.65%) and by Ghosh *et al* (14.7%) in Kolkata<sup>16</sup>. In a study done by Pavithra *et al* in Bangalore<sup>13</sup> females were having a higher prevalence of refractive errors than males and this difference was statistically significant. In the present study, females (6.68%) had a slightly higher prevalence of refractive error than males (6.32%) but this difference was not

statistically significant. Myopia was the commonest type of refractive error (71.85%), followed by astigmatism (15.53%) and hypermetropia (12.62%). These patterns are in accordance with those reported in a study done among school children in Bangalore<sup>6</sup> and Ahmedabad<sup>17</sup>. In our study, myopia (4.66%) was 5.6 times more prevalent than hypermetropia (0.82%). Almost similar findings have been reported in studies done in Kolkata<sup>16</sup> and in South India<sup>18</sup>. Considering the degree of myopia, 124 children out of 148 myopes (83.78%) had myopia of less than -2.0D and 24 children (16.21%) had myopia of  $\geq -2.0$  D, out of which 6 children (4.05%) had myopia of -6.0 D or more which also included 4 children with pathological myopia. Out of 206 students who were found to be having refractive error, 36.9% students were already wearing glasses at the time of screening. Ocular symptoms were present in 56.3% of the students with refractive error (including those children wearing glasses) and 43.7% students were asymptomatic. The proportion of uncorrected refractive errors in the present study was 63.1%. This might be due to lack of awareness about the need for refractive correction. Some studies have

observed that socioeconomic status, parental lack of awareness of vision problem, attitudes regarding the need of spectacles, spectacle cost, cosmetic appearance, and concerns that wearing glasses may cause progression of refractive error are contributing factors for this situation<sup>19</sup>.

## CONCLUSIONS

Vision impairment due to refractive errors is more common among school age children. Most of the children were unaware of their problem contributing to a high prevalence of undetected refractive errors. Vision screening of school children can be simple and highly effective strategy in detecting these conditions. This must be followed by affordable corrective services.

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