Pattern of Refractive Errors in Primary School Children in Dehradun City of Uttarakhand State

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Abstract

Objective: To assess the pattern of refractive errors in primary school children in Dehradun city of Uttarakhand region.

Settings and Design: Cross sectional descriptive study.

Materials and Methods: All school going children of both genders aged 5 to 16 years attending the eye OPD of a tertiary care teaching hospital, Dehradun, under the school screening programme 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.

Statistical Analysis done by: Chi square test.

Results: The prevalence of refractive error in primary school children in Dehradun was 13%. There was no significant difference in the prevalence of refractive error between males and females. The prevalence increased with age. The single most common refractive error was myopia, followed by astigmatism and then hypermetropia.

Conclusions: Refractive error is one of the leading causes of treatable blindness in school age children. There is a need to have regular vision testing in school children. Cost effective strategies are required to eliminate this easily treatable cause of vision impairment.

Keywords: refractive error, myopia, hypermetropia, astigmatism, prevalence.

Introduction

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. Uncorrected refractive errors are responsible for up to 42% of the cases of visual impairment worldwide, and remain prevalent even in high income countries. Uncorrected refractive error in both low and high income countries they have significant economic implications in terms of potential lost productivity. 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%. Because of the increasing realization of the enormous need for correction of refractive errors worldwide, 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. 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. In children, blindness due to uncorrected refractive error can hinder education, personality development and carrier opportunities in future, in addition to causing an economic burden on society. However this burden of economic loss may vary with the type of refractive error. Therefore the knowledge of pattern of refractive errors in school age children can help us in planning public health strategy.

Our study aims at evaluating the pattern of refractive errors in school age children in Dehradun city of Uttarakhand region. The purpose of this study was to gather information on the refractive status of students so that an effective approach can be planned to tackle the burden of readily correctable refraction problems in school children. The results were compared with similar studies in other parts of India and worldwide for commonality and inferences.

Subjects and Methods

The present study was a descriptive cross sectional study. Ethical clearance was taken from the institutional review board. All the primary school children attending the eye OPD of a tertiary care teaching hospital in Dehradun from January 2012 to June 2015, under the school screening programme were included in the study. A detailed history was taken from all the students including family history, current problems, past problems and treatment. The students then underwent a preliminary ocular examination. An internally illuminated Snellen’s chart was used at 6 meter distance for assessment of uncorrected, presenting and best corrected visual acuity (VA). Extraocular movements and cover test were performed using torch light, and convergence was tested using royal airforce (RAF) rule. All the children with defective vision (VA ≤ 6/12) were selected for detailed
ocular examination including VA both for distance and near, objective refraction with autorefractometer followed by streak retinoscopy under cyclopentolate 1% eye drops, stereopsis, anterior segment, and fundus examination. Examination was performed by a single refractionist and ophthalmologist to maintain informity. The parents of all children were informed about the nature of the study and a written consent was obtained. The patients with history of prior ocular surgery or any ocular disease contributing to the diminished VA, manifest strabismus and pathological myopia were excluded from the study. 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.22

Statistical Analysis: Chi-square test was used to analyze differences in the refractive errors between males and females and among different age groups. p value < 0.05 was considered significant.

Results
A total of 3146 children between 5 and 16 years of age were included in the study. Out of these, 1667 (53%) were males and 1479 (47.0%) were females, giving a male female ratio of 1.13. (Table-1)

The children were divided into four groups according to their age. (Table-2)

Unaided VA was normal (6/6) in 2737 (87%) children. Presenting VA was normal (6/6) in 2799 (89%) children. 210 students (6.7%) had presenting VA 6/9-6/12 and 114 students (3.6%) had VA 6/18-6/60 (Table-3). 105 (3.3%) students were wearing glasses out of which 62 (2%) students had presenting VA 6/6. Unaided VA worse than 6/12 was present in 199 (6.3%) students. After refractive correction, visual acuity was improved to 6/6 in 3128 students (99.4%).18 (0.6%) students were amblyopic with VA < 6/12 after refractive correction.

Table 1: Distribution of uncorrected, presenting and best corrected visual acuity (VA)

| VA          | Unaided n (%) | Presenting n (%) | Wearing glasses n (%) | Best corrected n (%) |
|-------------|---------------|------------------|-----------------------|----------------------|
| 6/6         | 2737 (87%)    | 2799 (89%)       | 62 (2%)               | 3128 (99.4%)         |
| 6/9-6/12    | 210 (6.7%)    | 210 (6.7%)       | 28 (0.9%)             | 10 (0.3%)            |
| 6/18-6/60   | 114 (3.6%)    | 98 (3.1%)        | 15 (0.5%)             | 8 (0.25%)            |
| <6/60       | 85 (2.7%)     | 39 (1.2%)        | 0                     | 0                    |

A total of 409 children (13%) had refractive error. Refractive error was prevalent in 225 males (13.5%) and 184 females (12.4%). There was no significant difference between the prevalence of refractive error between males and females (p>0.05). Prevalence of refractive error which was 9.1% in 5-7 years age group increased to 16.1% in 14-16 years age group. This increase was statistically significant. (p<0.01) (Table-4) Of the total 409 children with refractive error, myopia was present in 156 (38.1%) cases, hypermetropia in 31 (7.6%) and astigmatism in 222 (54.3%) cases. (Table-5) The prevalence of myopia increased from 8.9% in the 5-7 years age group to 43.6% in the 14-16 years age group. The prevalence of hypermetropia progressively decreased from 51.6% in the 5-7 years age group to 6.4% in the 14-16 years age group. The prevalence of astigmatism progressively decreased from 42.3% in the 5-7 years age group to 14.4% in the 14-16 years age group (Table-6).

Discussion
In India as in other developing countries, the school health services provided are hardly more than a token service because of the shortage of resources and insufficient facilities.13 Childhood blindness is a priority area because of the number of years of blindness that ensues. Data on the prevalence and causes of blindness in children is needed for planning and evaluating preventive and curative services for children. The prevalence of refractive error in this study
was 13% which was similar to the prevalence observed by Seema et al. in Haryana (13.65%). However this prevalence was much higher when compared to that observed by GVS Murthy et al. in New Delhi (6.4%) and Kumar et al. in Lucknow (7.4%). Similar studies from different parts of the world showed a prevalence of (8.2%) in Baltimore (USA), (12.8%) in Shunyi district in China, and (15.8%) in Chile. These variations in the prevalence data from studies carried out in different parts of the world are due to different operational definitions considered by investigators and also due to differences in demographic factors such as different geographical location, different socioeconomic class, different race etc.

There was an increase in the overall prevalence of refractive errors with advancing age as shown in Table-4. Our results were comparable with the study conducted by Pavithra et al. in Bangalore which showed the prevalence of refractive error more (7.5%) in the 13-15 years age group compared to 6.6% in the 7-9 years age group. A study conducted in Ahmedabad city showed that the prevalence of refractive errors was highest (40%) in 17 year old students compared to only 6.7% in 11 year old children. Mata S et al. also found that refractive error increased with increasing age especially in the age group of 10-14 years. There was no significant difference in the prevalence of refractive error between males and females in our study (p=0.05) as shown in Table-4. This was similar to the results shown by Ande V R et al. in Andhra Pradesh and Krishnan V M et al. in Villupuram and Puducherry, where no sex predilection of refractive error was noted. However some studies showed evidence of increased prevalence in female students, which was attributed to the earlier attainment of puberty by girls with respect to boys. This was in contrast to the findings of Sriram C et al. in Tamil Nadu which showed refractive errors to be more prevalent in male children (21.5%) than female children (17%).

In our study the single most common refractive error was astigmatism followed by myopia. Hypermetropia was least common of all as shown in Table-5. Our results were comparable with the study conducted by Rai et al. in Rupandehi district Nepal on primary school children. They found that the commonest refractive error among school children was astigmatism, followed by myopia (26%) and then hypermetropia (19%). Pavithra et al. in Bangalore, Sethi S et al. among school children of Ahmedabad, and S Matta et al. among the adolescents attending outpatient department of ophthalmology in New Delhi, concluded that myopia was the most common refractive error among school children followed by astigmatism and hypermetropia. A study conducted by Medi K et al. in Kampala district showed that the commonest refractive error was astigmatism (52%), followed by hypermetropia (37%) children and myopia (11%). In a study of Prevalence of refractive errors in school children of Tafila city conducted by Hussein A et al., it was found that myopia (63.5%) was the most common type of refractive error followed by hypermetropia 11.2% and astigmatism 20.4%.

In the present study, myopia showed an increasing trend with advancing age whereas hypermetropia and astigmatism showed a decreasing trend with advancing age which was statistically significant (p<0.05) as shown in Table-6. Similar pattern was shown in many previous studies conducted in New Delhi, Bangalore; Andhra Pradesh and Kolkata. There was no significant difference in the prevalence of myopia, hypermetropia and astigmatism between males and females in our study. (p>0.05) (Table-7) Similar results were shown in a study conducted in Villupuram and Puducherry. Hypermetropia was shown to be associated with female sex in some of the previous studies. In a study conducted by Pune, myopia was found to be more prevalent in females (57.35%) as compared to males (42.65%). Hypermetropia was equally prevalent in both sexes (50%), astigmatism was found only in females (100%) and myopia was shown to be associated with female gender 65% and having a father with higher level of schooling in a study conducted in Kolkata. Myopia was shown to have no sex predilection in few other studies.

The presenting VA was 6/6 in 89% students, while after refractive correction 99.4% students could attain a VA of 6/6. Our results raise the need for school-based program that provides prescription of glasses when needed to students at no cost, through government and non-governmental collaborative fund.

In 18 (0.6%) students in our study suffered from amblyopia. Amblyopia treatment is most effective when done early in the child’s life, usually before the age of seven. School screening is the best way to detect amblyopia in school children. Our study had some limitations. Detailed evaluation was done only in children with vision less than 6/12. Thus some refractive errors like latent hypermetropia
might have been missed. Patients with manifest strabismus and pathological myopia were excluded which might distort the demographic data marginally. A major limitation of our study was that only school going children were included in the study. Significant proportion of the children in rural India and other developing countries do not go to schools; hence a more complete assessment of visual impairment in children would be possible with population based studies not restricted only to school going children.

Studies from all over the continents and from India suggest early screening, spectacle compliance and spreading awareness among parents to motivate students to use spectacles. Improved utilization of existing eye care services and a public-private partnership in strengthening the health services is required.

Conclusion
Refractive error is a common cause of visual impairment among school children in low and middle income countries. Visual impairment from uncorrected refractive errors can have immediate and long-term consequences in children and adults such as lost educational and employment opportunities, lost economic gain for individuals, families and societies and impaired quality of life. Various factors are responsible for refractive errors remaining uncorrected: lack of awareness and recognition of the problem at personal and family level, as well as at community and public health level; non-availability of and/or inability to afford refractive services for testing; insufficient provision of affordable corrective lenses; and cultural disincentives to compliance. Strategies such as vision screening programmes need to be implemented on a large scale to detect individuals suffering from refractive error blindness.

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