

A STUDY ON THE PREVALENCE OF REFRACTIVE ERRORS AMONG SCHOOL CHILDREN OF 7-15 YEARS AGE GROUP IN THE FIELD PRACTICE AREAS OF A MEDICAL COLLEGE IN BANGALORE

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ABSTRACT

Background: Refractive Error is an avoidable cause of visual impairment. Diagnosis and Treatment of refractive errors is the simplest and most effective forms of eye care.

Aims & Objective: To study the prevalence and determinants of uncorrected refractive errors, among school children of 7-15 years.

Material and Methods: The study was a cross sectional study of 1378 government school children of 7- 15 years age group in both rural and urban field practice areas of Dr. BR Ambedkar Medical College, Bangalore. Students were screened for defective vision with the help of Snellen's chart and refractionist confirmed the findings. Students with refractive error were provided with spectacles free of cost. Data was analysed to determine the prevalence of refractive errors among the school children.

Results: 687 children of urban and 691 children of rural area were examined. 53.6% of the study population were boys and 46.4% were girls. The mean age of the study group was 12.4 years. The prevalence of uncorrected refractive error in urban and rural children was 7.03%. The prevalence of Myopia, Hypermetropia and Astigmatism in children was 4.4%, 1.03%, 1.6% respectively. Children 13 to years 15 attending urban schools were most likely to have uncorrected myopia. Hypermetropia was associated with younger age group and female children.

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.

KEY-WORDS: Refractive Error; Prevalence; Hypermetropia; Myopia; School Children

Introduction

Ametropia (a condition of 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 dioptric power of the eye when the accommodation is at rest.^[1]

Childhood blindness is one of the priorities in Vision 2020: the right to sight.^[2] It is estimated that there are 1.4 million blind children in the world, two thirds of whom live in the developing countries, and of all the blind children it is estimated that 2,70,000 live in India.^[3] Blindness is one of the significant social problem in India. About 80% of it is avoidable blindness, but a large number of those affected remain blind due to lack of access to eye care. Uncorrected refractive

errors are responsible for about 19.7% of blindness.^[4] About 13% of Indian population is in the age group of 7-15yrs. And about 20% of children develop refractive error by the age of 16 years.^[5]

Most of the children with uncorrected refractive error are asymptomatic and hence screening helps in early detection of refractive errors and timely interventions. In developing countries very few data is available on the prevalence of refractive errors in children. This data can be help full in primary eye health care planning.

Uncorrected refractive error may have impact to a larger extent on the learning capability and potential of the student. Timely detection and intervention can improve child's potential tremendously during the formative years.

Materials and Methods

This was a cross sectional study carried out in the government schools of urban and rural field practice area of Dr. BR Ambedkar Medical College, Bangalore. The study population comprised of all the children in 7-15 years age group in the government schools of urban and rural field practice area. The ethical committee of Dr. BR Ambedkar Medical College, Bangalore gave written consent to conduct this study. Written consents of school principals of all the schools and assent of the children were obtained. The research protocol adhered to the provision of the Declaration of Helsinki for research involving human beings.

A pilot study was conducted in urban and rural area and a questionnaire was finalised in order to collect information from the students. The distant vision of a child was tested utilizing Snellen's Illiterate 'E' chart. The visual acuity was tested with the chart at 6 meters. If uncorrected vision was $<6/12$ in either eye, the child was declared to have defective vision.^[6]

The schools were revisited with a refractionist on a pre-fixed date. All the students with defective vision were examined by the refractionist. Objective refraction was performed with retinoscope which was followed by subjective refraction till the best corrected visual acuity was achieved. Hypermetropes and those in whom best corrected visual acuity could not be achieved underwent cycloplegic refraction with tropicamide eye drops. Children already wearing spectacles were also examined and change in power was noted. Myopia was considered when the measured refraction was more than or equal to -0.5 spherical equivalent diopters in one or both eyes. Hypermetropia was considered when the measured objective refraction was greater than or equal to $+1.00$ spherical equivalent diopters in one or both eyes. Astigmatism was considered to be visually significant if ≥ 1.00 D. The visual acuity, types of refractive error and correction was noted down. Corrective spectacles were provided to the students free of cost. Children with other ocular problems were referred to department of Ophthalmology in Dr. BR Ambedkar Medical College.

The data was entered in microsoft xl spreadsheet and analysis was done using the statistical package for social sciences (spss 17 version). Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Results

The study population comprised of 1378 students, out of which 50.1% were from rural schools and 49.9% were from urban schools. The study group had 53.6% boys and 46.4% girls and 53.5, 27.9 and 18.7% of the children belonged to the age group of 13-15 years, 10-12 years and 7-9 years respectively.

All the children were screened for defective vision with the help of Snellen's chart and 142 (10.2%) children had difficulty in reading the chart from a distance of 6 m. Out of these children 18 remained absent during revisit with the refractions and 97 (7.03%) of the children were confirmed of having refractive error. The Prevalence of Refractive Error in this study was found to be 7.03%.

Though the difference in the prevalence of refractive error was not statistically significant ($p=0.803$) higher prevalence (7.5%) was seen in the age group of 13-15 years and among children of 8th-10th standard (8.1%). The prevalence of refractive error was more in girls (9%) compared to boys (5.3%) and this difference was statistically significant ($p = 0.0061$). And prevalence was significantly ($p= 0.0249$) more in children of urban schools (8.5%) compared to the children from rural schools (5.4%).

Family history of refractive errors which was assessed with the history of spectacle usage among family members (parents and siblings) was found to be significantly associated with the prevalence of refractive error ($p = <0.00001$).

Myopia was the commonest type of refractive error followed by Astigmatism & Hypermetropia [Table 1]. The prevalence of myopia increased with age and this association was found to be statistically significant ($p<0.001$). Association of socio-demographic variables with other types of refractive errors was studied [Table 2].

Table-1: Distribution of Type of Refractive Errors among Cases and the Study Group

Type	No. of Children	% among the Cases	% in the Study Group
Myopia	61	62.9%	4.4%
Hypermetropia	14	14.4%	1.03%
Astigmatism	22	22.7%	1.6%
Total	97	100%	7.03%

Table-2: Association of Socio-Demographic Variables with Type of Refractive Errors

Socio-Demographic Variables	Type Refractive Errors			p value
	Myopia N=61	Hypermetropia N=14	Astigmatism N=22	
Age in Years				
7-9 years	4 (6.6)	10 (71.4)	3 (13.6)	<0.001**
10-12 years	16 (26.2)	3 (21.4)	6 (27.3)	
13-15 years	41 (67.2)	1 (7.1)	13 (59.1)	
Gender				
Male	28 (45.9)	0 (0)	11 (50)	0.004**
Female	33 (54.1)	14 (100)	11 (50)	
Class				
3 rd -5 th standard	9 (14.8)	13 (92.9)	5 (22.7)	<0.001**
6 th - 7 th standard	11 (18)	0 (0)	3 (13.6)	
8 th -10 th standard	41 (67.2)	1 (7.1)	14 (63.6)	
Region				
Urban	38 (62.3)	9 (64.3)	12 (54.5)	0.783
Rural	23 (37.7)	5 (35.7)	10 (45.5)	

Discussion

In India, as in other developing countries, the school health services provided are hardly more than a token service because of shortage of resources and insufficient facilities.^[7] The refractive services provided as a part of school health programme in the schools included in this study was poor in both urban and rural areas.

The prevalence of refractive error in this study population was 7.03% similar to the prevalence observed by GVS Murthy et al in New Delhi (6.4%).^[8] and Kumar et al in Lucknow (7.4%)^[9]. But less compared to the prevalence observed by Seema S et al in Haryana (13.65%).^[10] Similar studies from different parts of the world showed a prevalence of (8.2%) in Baltimore (USA)^[11], (12.8%) in Shunyi district in China^[12], (2.9%) in Nepal^[13], (15.8%) in Chile^[14]. These variations in the prevalence data from studies in different parts of the world are due to different operational definitions considered by investigators and also due to differences in demographic factors.

The study shows that the prevalence of refractive error was found more (7.5%) in the 13- 15 year

age group compared to 6.6% of 7-9 years age group which was similar to the results of a study conducted in Ahmedabad city where the prevalence of refractive errors was highest (40%) in 17 years old students compared to only 6.7% in 11 year old children.^[5] S Matta et al also found that refractive error increased with increasing age especially in the age group of 10- 14 years.^[15]

Refractive error was more prevalent in the female children (9%) compared to male children (5.3%) and this difference was statistically significant (p=0.0061). Seema Sharma et al found that prevalence of refractive error was 23.7% in girls and only 12.2% in boys.^[10] Similar results were found by Tay MT et al in their study on young Singaporeans. They related this high prevalence to the higher rate of growth in girls and also because girls attain puberty earlier than boys.^[16]

Higher prevalence (8.1%) of refractive errors in children of class 8th to 10th standard in this study matched with the study done in Ahmedabad city there by showing that ametropia is related to number of years of schooling.^[5]

The prevalence of refractive error was found to be significantly high (p=0.0249) in the urban area, similar to the findings of Vivek Trivedi et al in their population based study in Gujarat,^[17] Dandona et al in Andhra Pradesh.^[18] Afroz A Khan in Srinagar.^[19] Amrutha S Padhye et al also reported a higher prevalence of 5.46% among the children in the urban area compared to 2.63% in rural India.^[20]

The association between family history of parents or siblings wearing spectacles and refractive errors was highly significant. Ayub Ali et al in their study found a very strong relationship between refractive errors and heredity or familial factors (p=0.00002).^[21] Saw et al also reported that a positive family history of myopia is related to the progression of myopia and refractive error.^[22]

Myopia was the most common type which constitutes for 62.9% of the refractive errors. Astigmatism was seen in 22.7% of the cases which includes Myopic and Hyperopic Astigmatism and Hypermetropia was seen in 14.4% of the cases.

Similar pattern of prevalence was observed by Sonam Sethi et al among school children of Ahmedabad [5] and by S Matta et al among the adolescents attending outpatient department of ophthalmology in New Delhi.[15]

When association of type of refractive errors with socio demographic variables was studied we found that the prevalence of myopia and astigmatism significantly increased with age and number of years of schooling. Whereas the prevalence of hypermetropia was found to be significantly higher in the younger age group of 7-9 years and in the 3rd -5th standard students. And hypermetropia was significantly associated with female gender.

GVS Murthy et al also found that there was an age-related shift in refractive error from hypermetropia in young children (15.6% in 5-year-olds) toward myopia in older children (10.8% in 15-year-olds) and association of hypermetropia with female gender.[8] Kalkivayi V et al in Andhra Pradesh found that myopia was significantly higher among children of >10 years ($p < 0.001$) and hypermetropia was significantly associated with female gender ($p = 0.001$).[23] In a study conducted in Mechi, Nepal by Gopal P et al showed that the female gender was associated with hypermetropia at a statistically significant level but age was not. Where as in myopia, the association with increasing age was significant but gender was not significantly associated.[13]

In the present study 3 children were found to be having Amblyopia. A boy of 7 years, and two girls of 9 & 11 years. They were referred to the department of Ophthalmology for further evaluation and treatment. We did not find any cases of blindness in this study. Amblyopia treatment is most effective when done early in the child's life, usually before age 7.[1] School screening is the best way to detect amblyopia in school children.

Only 39 children complained of inability to see the black board clearly while 97 children actually had poor distance vision. This shows that children may not be aware of their problem and thus screening in schools for visual disabilities is very important for early detection and treatment.

Limitations of our study were, Cycloplegia was performed only for the children with hypermetropia and those in who best corrected visual acuity could not be achieved so there could be an overall underestimation of refractive errors. Only school going children were included in the study. Significant proportion of 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. Population based studies covering the non-school going children are recommended.

Conclusion

These data support the assumption that vision screening of school children in developing countries would be very useful in early detection of correctable causes of poor vision, especially refractive errors and in preventing long term visual complications. The present study indicates that the school age is a high risk group for developing refractive errors. Most of the children were unaware of their problem and prevalence of undetected refractive error was high. The existing school health services should be strengthened and implemented effectively. Provision of affordable corrective services should follow screening, especially to this age group. More studies to determine the extent of the problem, more manpower and resources are needed to solve the problem of uncorrected refractive error and to achieve the goal of Vision 2020.

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