

Study of Disorders of Visual Acuity among Adolescent School Children in Pune

Col A Datta*, Lt N Bhardwaj+, SR Patrikar#, Col R Bhalwar**

Abstract

Background: Disorders of visual acuity are known to affect the learning abilities of school children. Various authors have reported varying prevalence in India and abroad.

Methods: A rapid, community based survey was conducted to assess the prevalence of disorders of visual acuity among adolescent school children in three schools in Pune Cantonment. A sample of 236 children studying in six sections were examined after random selection by a two stage sampling technique ensuring representation to each of the classes. Visual acuity was assessed for all the children available in the selected section on the date of survey. A questionnaire based study of the knowledge and attitude of the parents of the 50 affected children was also conducted.

Result: 50 children (25 males and 25 females) were found to have errors of refraction, resulting in prevalence rate of 21.19% with confidence intervals of 15.97% to 26.40%.

Conclusion: The study highlights significantly high prevalence of uncorrected errors of visual acuity among adolescent school children as well as the need for instituting IEC activities aimed at improving the general lack of appreciation of the seriousness of the problem by the parents and consequent neglect of urgent corrective measures.

MJAFI 2009; 65 : 26-29

Key Words : Visual defects; Adolescent school children

Introduction

It is estimated that 2.3 billion people worldwide suffer from refractive errors. The vast majority of these could have their sight restored by spectacles, but only 1.8 billion people have access to eye examinations and affordable correction. This leaves approximately 500 million people, mostly in developing countries, and many children, with uncorrected error causing blindness and impaired vision [1]. Undetected or under corrected disorders of visual acuity are known to affect the learning abilities of school children who have difficulty to read material written on the blackboard. This can adversely affect a child's education, occupation and socioeconomic status for life [2]. Reports of various surveys conducted on school children in India and abroad have indicated varying prevalence of errors of refraction [3-9].

The earliest signs of disorders of visual acuity are "strain" of the eyes with redness, watering and headache at the end of school timings. Although the child may report his problems to his parents, lack of awareness of the need for early and prompt correction of such disorders, misconceptions, social and cultural customs and beliefs may affect utilization of available health services.

It is therefore pertinent to estimate the prevalence of visual acuity disorder among adolescent school children and to assess the attitude of their parents towards health services utilization to plan any intervention strategy in this regard. The present study was therefore conducted among school children in Pune Cantonment to ascertain the prevalence of disorders of visual acuity and assess the health seeking attitudes of the parents / guardians of children with such disorders.

Material and Methods

The present study was a cross-sectional, community based study conducted in settings of three schools located in Pune Cantonment for duration of one month in August - September 2006. Based on the expected population parameters (of adolescent school children likely to have disorders of visual acuity) as 20% ($p=0.20$), and to capture the parameter within a precision of 95% confidence interval (CI 15 to 25%), the sample size was calculated as 226.

The sample was drawn out of the total 2747 children studying in 56 sections of class V to X in the three schools, by a two stage random sampling technique. In the first stage, by draw of lots, one section was selected of each of the six classes included in the study. In the second stage, all children in the selected six sections, which worked out to 236, and hence more than the minimum required sample, were examined

*Associate Professor, #Lecturer (Statistics and Demography), **Professor & Head (Department of Community Medicine & PSM), AFMC Pune-411040. + Medical Officer, MH, Dehradun.

for visual acuity and findings recorded.

The parents of all the children found to have a defect of visual acuity were forwarded a questionnaire in Marathi through the Principal to assess their knowledge and attitudes towards health services utilization with specific reference to visual defects. A total of 30 of the 50 parents (60%) responded.

Vision testing was conducted by a final III MBBS student and Residents in Community medicine, especially trained in eye examination. Besides the examination to detect any obvious external abnormality in the eyes, the visual acuity was tested for distance vision using Snellen’s test type (Hindi) placed at a distance of 6 meters from the student and near vision using near vision test type (Hindi) with the student holding the chart in his/her hand at a distance of approximately 30 cms from the face.

Results

A total of 236 children (126 boys and 110 girls) who were present on the day of the study were examined. None of the examined children were using spectacles. There were 50 children (25 boys and 25 girls) with error of visual acuity constituting 21.19% of the examined children (19.84% among boys and 22.73% among girls) with 95% CI of 15.97% to 26.40%. There was no statistically significant difference in the overall presence of errors of visual acuity among boys and girls ($\chi^2 = 0.29, df = 1, p > 0.05$).

Eight children (two boys and six girls) had errors of near vision while 47 (25 boys and 22 girls) had errors of distant vision. Five children (two boys and six girls) had both errors of distant and near vision. The details of findings as per class of study are indicated in Table 1. Other eye problems detected were squint in three (two boys and one girl), corneal opacity in one and pterygium in one case. The prevalence of “visual impairment” as per the WHO definition (uncorrected vision of 6/12 in best eye for those aged below 15 years and

uncorrected vision in the best eye of 6/18 for those above 15 years), was found in 14 children (eight boys and six girls), comprising 5.93% of the surveyed children. The prevalence of errors of visual acuity ranged from a low 3.23% in children aged 10 years to a high 33.33% in children aged 13 years. Among both boys and girls, the highest prevalence was found among children aged 13 years. There was no clear statistically significant trend seen with increasing age. The findings are presented in Table 2.

Questionnaire prepared in Marathi was dispatched to the parents all 50 children found to have error of visual acuity through the Principals of the three schools. In spite of repeated efforts only 30 (60%) of the forms were received and analysed.

The families of the children with errors of visual acuity belonged to Maharashtra, predominantly Hindus (26 out of 30; 87%) with three Muslims and one Christian, and mainly hailed from urban areas (27 out of 30 ; 90%). The mothers of all the children were housewives while the father was predominantly unskilled workers (14 out of 30; 47%). As per Kuppuswamy’s socio-economic scale they mainly belonged to low socio-economic scale (27 out of 30; 90%). The educational standard of the father was mainly “under matric” though there was one graduate and three inter qualified. The educational standard of the mother was predominantly “under matric” with only two being matric qualified.

The health services utilization profile revealed that 16 out of 30 (53%) were entitled for some form or the other of free medical services provided by the employer while the other, 47% were not and were dependent on state governmental health services. Eighteen out of 30 (60%) of the parents were aware of their child’s “eye problems” and conceded that poor vision of their child could affect their scholastic performance. Only 10 out of 30 (30%) stated that they would take their child to the eye clinic for further management.

Table 1
Prevalence of errors of visual acuity of children as per class studied

Class studied	Boys		Girls		Total		95% CI
	No. examined	No. with defective vision	No. examined	No. with defective vision	No. examined	No. with defective vision	
V	16	2 (12.5%)	18	0	34	2 (5.88%)	-2.03 13.79
VI	29	6 (20.69%)	17	8 (47.06%)	46	14 (30.43%)	17.14 43.73
VII	29	6 (20.69%)	25	7 (28.00%)	54	13 (24.07%)	12.67 35.48
VIII	15	1 (6.67%)	16	3 (18.75%)	31	4 (12.90%)	1.10 24.70
IX	20	8 (40.00%)	22	5 (22.73%)	42	13 (30.95%)	16.97 44.93
X	17	2 (11.76%)	12	2 (16.67%)	29	4 (13.79%)	1.24 26.34
Total	126	25 (19.84%)	110	25 (22.73%)	236	50 (29.19%)	15.97 26.40

χ^2 (boys, girls) = 0.29 , df = 1, p>0.05, χ^2 for linear trend = 0.281, p>0.05

Table 2
Prevalence of errors of visual acuity as per age of children

Age in years	Boys		Girls		Total		95% CI
	No. examined	No. with defective vision	No. examined	No. with defective vision	No. examined	No. with defective vision	
10	14	1 (7.14%)	17	0 (Nil)	31	1 (3.23%)	-3.00 – 9.45
11	21	3 (14.29%)	17	9 (52.94%)	38	12 (31.58%)	16.80 – 46.36
12	16	5 (31.25%)	19	2 (10.53%)	35	7 (20.00%)	6.75 – 33.25
13	27	9 (33.33%)	15	5 (33.33%)	42	14 (33.33%)	19.08 – 47.59
14	13	2 (15.38%)	22	6 (27.27%)	35	8 (22.86%)	8.94 – 36.77
15	13	3 (23.08%)	10	2 (20.00%)	23	5 (21.74%)	4.88 – 38.60
16	11	1 (9.09%)	8	1 (12.50%)	19	2 (10.53%)	-3.28 – 24.33
17	8	1 (12.50%)	2	0 (Nil)	10	1 (10.00%)	-8.59 – 28.59
18	3	0 (Nil)	0	0 (Nil)	3	0 (Nil)	-
Total	126	25 (19.84%)	110	25 (22.73%)	236	50 (21.19%)	15.97 – 26.40

χ^2 for linear trend = 0.001, $p > 0.05$

Table 3
Health care attitudes of parents of children with visual defect

Attribute	No. reported	% (n=30)	95% CI
Eye care service availability	16	53.33	35.48 – 71.19
Awareness of child's eye problem	18	60.00	42.47 – 77.53
Accept eye problem affects schooling	18	60.00	42.47 – 77.53
Plan to take child to eye clinic	10	33.33	16.46 – 50.20
Correctly enumerate eye strain symptoms	9	30.00	13.60 – 46.40
Felt child healthy	20	66.67	49.80 – 83.54

Discussion

The importance of visual acuity studies was realized for the first time in USA during medical examination of recruits for drafting during Second World War [10]. In India, Mukherjee et al [11], stated that planning of a youth's career is dependent on visual acuity and warrants early detection and treatment of refractive errors to prevent permanent disability.

The present study revealed an overall prevalence of visual acuity errors at 21.19% with 95% CI of 15.97% to 26.40%. There was no statistically significant difference in prevalence of errors of visual acuity between boys and girls with no trends in the prevalence of visual disorders as per age or class. WHO has defined "Visual Impairment" for children up to 15 years of age as uncorrected visual acuity of less than 6/12 in the better eye and for people over 15 years of age as uncorrected visual acuity of less than 6/18 in the better eye [12]. The prevalence of visual impairment was found to be 5.93% in the present study. The findings of the present study are similar to other surveys reported from India and abroad [3-9].

The highest prevalence of visual errors in the present study was found among girls at an earlier age of 11 years (52.94%) as compared with boys where the peak prevalence was found at age 13 years. It may be considered that the average age of maximum physical growth in girls is earlier than that in boys which may account for this observed difference. Similar findings have also been reported by Venkatramana et al [13].

In the present study however, the cumulative effect of adolescent physical changes was not noted. It was expected that the prevalence of visual disorders if not corrected should have increased with increasing age. It has been already stated that none of the 236 children examined were using spectacles. Therefore, the highest prevalence should have been in the higher classes as well as in the higher age groups. Eye strain among those already having defective vision should manifest under these conditions, resulting in usage of spectacles, which was not observed in our study.

We also attempted to ascertain the knowledge and attitude of the parents towards visual defects in this study. Economic constraints play a very important role in determining the acquisition of spectacles by those who have developed refractory errors. Taylor [2], stated that children are especially vulnerable as they are dependent on their parents for procurement of spectacles, the absence of which could seriously impair their scholastic activities and impair their future earning capabilities. Jain et al [14], concluded that community participation in any eye health intervention project is critical to its success. In most of the developing world, the routine survival requirements of food, housing and clothing are usually beyond the economic capabilities of a substantial proportion of the people. In these communities, children's education is a factor of affordability of their parents to send them to school as well as keep them away from gainful employment. It is likely that refractory errors

may be a disincentive for these children to continue their studies.

Various cultural factors, beliefs, misconceptions and practices also play a very important role in the utilization of health services. The Kariapatti Pediatric Eye Evaluation Project has reported on the presence of such social factors influencing the success of eye health intervention projects. The need to sensitise the community to the need for corrective measures for the future of these children has been precisely identified. The role of focus group discussions as a tool to bring about these changes in knowledge and behaviour has also been amply demonstrated [15,16].

The present study has clearly highlighted the apparent lack of concern among the parents of children with refractory errors who failed to respond to the questionnaire. The responses brought out that 18 (60%) of the respondents were already aware that their child had a defective vision and a similar number knew that such a defect was detrimental to the scholastic activities of their child. Yet only 10 (33%) of the respondents indicated that they would be taking their child to the eye clinic for necessary corrective action. It is likely that procurement cost of spectacles which are not free of cost in most health care systems in India may be inhibiting the parents from initiating action to provide correction of the detected refractory error in the children.

The present study has provided a clear indication of the magnitude of disorders of visual acuity among school children in Pune Cantonment. Urgent eye examination of all school children must be preceded with necessary actions to secure community participation in subsequent intervention activities. The findings clearly elucidated the discouraging attitude of most of the parents towards a problem potentially likely to affect the scholastic and economic future of their affected child. The knowledge that many of the parents already knew of the problem but had done nothing reinforces the need to consider behaviour change communication before any intervention activities aimed at correcting the disorders can be considered.

Provision of corrective spectacles as part of the school health services may be required along with active community participation to ensure that the school children realize their full scholastic potential and become useful and productive future citizens of the country.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Col A Datta, Lt N Bharadwaj, SR Patrikar, Col R Bhalwar

Drafting & Manuscript Revision : Col A Datta, Lt N Bharadwaj, SR Patrikar, Col R Bhalwar

Statistical Analysis : Col A Datta, Lt N Bharadwaj, SR Patrikar, Col R Bhalwar

References

1. Holden BA, Sulaiman S, Knok K. The challenge of providing spectacles in the developing world. *J Comm Eye health* 2000;13:9-10.
2. Taylor HR. Refractive errors: magnitude of the need. *J Comm Eye Health* 2000;13:1-2.
3. Saw SM, Goh PP, Cheng A, Shankar A, Tan DTH, Ellwein LB. Ethnicity-specific prevalence of refractive errors vary in Asian children in neighbouring Malaysia and Singapore. *Br J Ophthalmol* 2006 ; 90:1230-5.
4. Pan American Health Organization: Strategic Plan for Vision 2020: The Right to Sight- Caribbean Region. Washington DC. Barbados, PAHO, 2002, 4-5.
5. Murthy GVS, Gupta SK, Ellwein LB, Munoz SR, Pokharel GP, Sanga L, et al. Refractive error in children in an urban population in New Delhi. *Invest Ophthalmol Vis Sci* 2002; 43:623-31.
6. Gupta M, Gupta Y. A survey on refractive error and strabismus among children in a school at Aligarh. *Indian J Public Health* 2000 ;44:90-3.
7. Murthy GVS. Vision Testing for Refractive Errors in schools. *J Comm Eye Health* 2000;3:3-4.
8. Dandona R, Dandona L, Srinivas M, Sahare P, Narsaiah S, Munoz SR, et al. Refractive error in children in a rural population in India: *Invest Ophthalmol Vis Sci* 2002; 43: 615-22.
9. Sethi S, Kartha GP. Prevalence of Refractive Errors in School Children (12-17 Years) of Ahmedabad City. *Indian Journal of Community Medicine* 2000;25: 10-2.
10. Davens E. The nationwide alert to pre-school vision. *Screening sight saving review* 1966; 1:180-4.
11. Mukherjee R, Seal SC. An epidemiological study of refractive errors among school children in Calcutta. *JIMA* 1973, 73: 59-64.
12. WHO. Elimination of avoidable visual disability due to refractive errors: report of an informal planning meeting, Geneva, 2000; 1-54.
13. Venkatramana K, Naduvilam T. Visual impairment in school children in Southern India. *Ind Jour of Ophthalmol* 1997; 129-34.
14. Jain BK, Sudhan A, Pinto S. Community participation in addressing the challenges of childhood blindness. *Community Eye Health Journal* 2005; 18: 56.
15. Nirmalan PK, Vijayalakshmi P, Sheeladevi S, Kothari MB, Sundaresan K, Rahmathullah L. The Kariapatti Pediatric Eye Evaluation Project (KPEEP): Baseline ophthalmic data of children aged 15 years or younger in South India. *Am J Ophthalmol* 2003;136:703-9.
16. Nirmalan PK, Sheeladevi S, Tamilselvi V, Victor AC, Vijayalakshmi P, Rahmathullah L. Perceptions of eye diseases and eye care needs of children among parents in rural south India: The Kariapatti Pediatric Eye Evaluation Project (KPEEP). *Indian J Ophthalmol* 2004;52:163-7.