

Pattern of Refractive Errors in Primary School Children in Rural Areas of Jammu City of Jammu and Kashmir, India

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Abstract

Introduction: Visual impairment in children is mostly detected during school screening program in accordance with National Programme for Control of Blindness (NPCB).

Materials and Methods: All schoolgoing children of both genders aged 5-16 years under school screening program underwent visual acuity (VA) assessment, ocular motility evaluation, and cover-uncover test. Depending on type of eye disease, they were categorized. 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-mydratic examination. Children with prior ocular surgery or any ocular disease contributing to diminished VA, manifest strabismus, and pathological myopia were excluded from the study.

Results: The prevalence of refractive error in this study is 11.6%. There is no significant difference in prevalence of refractive error between two sexes. The prevalence increases with age. The common refractive error was astigmatism followed by myopia and then hypermetropia.

Conclusion: Refractive error is important cause of treatable blindness in schoolgoing children in the age group of 5-16 years. Hence, regular eye screening among schoolchildren is mandatory as is covered under NPCB.

Key words: Amblyopia, Astigmatism, Hypermetropia, Myopia, Refractive error

INTRODUCTION

Visual impairment in children is mostly detected during school screening program in accordance with National Programme for Control of Blindness. Uncorrected refractive errors constitute a large number of children with treatable blindness.¹ Poor vision in children can profoundly affect his/her participation and learning in the classroom. This can interfere with education, personality development, and career opportunities in the future in addition to causing an economic burden on society. However, this burden of

economic loss may vary with type of visual impairment. Hence, knowledge of prevalence and pattern of visual impairment in schoolchildren can help us in planning public health strategy.

- Approximately 12.8 million children in the age group 5-16 years are visually impaired from uncorrected or inadequately corrected refractive errors, estimating a global prevalence of 0.96%.²
- Due to increasing realization of visual requirements in children, childhood blindness has been considered one of the priorities of Vision 2020 - the right to sight-a global initiative launched by a coalition of non-government organizations and the WHO.³ Uncorrected refractive errors are prevalent even in high income countries.⁴
- This study aims at evaluating pattern and prevalence of refractive errors in school age children in rural area of Jammu which can help us in planning public health strategy.

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MATERIALS AND METHODS

- The present study is a descriptive cross-sectional study. Ethical clearance was taken from the institutional review board. All primary schoolchildren who attended Eye Outpatient Department of Acharya Shri Chander College of Medical Sciences and Hospital, Jammu in 2015, 2016 and till date in 2017 and those children who were screened during school eye screening camps in school premises itself, were included in this study under school screening program.
- Detailed history was taken from all the students including family history, current problems, past problems, and treatment taken.
- The students then underwent a preliminary ocular examination. Snellen's chart was used at 6 m 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 air force rule.
- Children with defective vision were selected for detailed ocular examination including VA both for distance and near, objective refraction with autorefractometer followed by streak retinoscopy under 1% cyclopentolate eye drops, anterior segment, and fundus examination.
- Children with prior ocular surgery were excluded from the study.

Statistical Analysis

- Chi-square test was used to analyze differences in the refractive errors between males and females and among different age groups.
- $P < 0.05$ was considered significant.

RESULTS

- A total of 642 children between 5 and 16 years of age were included in the study. 340 (52.95%) out of these were male students and 302 (47.04%) were female students giving a male: female ratio of 1.12 (Table 1).
- Students were divided into four groups according to their age (Table 2).
- Unaided VA was normal (6/6) in 567 (88.31%) students. Presenting VA was normal (6/6) in 586 (91.27%) students.
- Presenting VA 6/9-6/12 was found in 45 (7%) students.
- Presenting VA of 6/18-6/60 was observed in 17 (2.64%) students.
- VA $< 6/60$ was seen in 13 (2.02%) students.

Table 1: Sex distribution of students

Sex	n (%)
Male students	340 (52.95)
Female students	302 (47.04)

Table 2: Age-wise distribution of student

Age (in years)	n (%)
5-7	77 (11.98)
8-10	167 (26.01)
11-13	205 (31.93)
14-16	193 (30.06)

- 26 (12.7%) students were wearing glasses out of which 19 students had presenting VA of 6/6.
- After refractive correction, VA improved to 6/6 in 636 (99.06%) students. 2 (0.31%) students whose best-corrected VA was $< 6/12$ were amblyopic (Table 3).
- A total of 75 children (11.6%) had refractive error. Refractive error was prevalent in 42 (12.35%) males and 33 (10.92%) females. There was no significant difference between the prevalence of refractive error between male and female sex ($P > 0.05$).
- The prevalence of refractive error which was 3.8% in 5-7 years age group increased to 17.6% in 14-16 years age group. This increase was statistically significant ($P < 0.01$) (Table 4).
- Of the total 75 children with refractive error, myopia was present in 28 (36.9%) cases; hypermetropia in 6 (8.3%), and astigmatism in 41 (54.8%) cases (Table 5).
- The prevalence of myopia increased from 8.6% in 5-7 years age group to 42.7% in 14-16 years age group. The prevalence of hypermetropia progressively decreased from 52.3% in 5-7 years age group to 6.6% in 14-16 years age group. The prevalence of astigmatism progressively decreased from 34.9% in 5-7 years age group to 16.5% in 14-16 years age group (Table 6).
- The prevalence of myopia was 57.1% in males and 42.8% in females. The prevalence of hypermetropia was 66.6% in males and 33.3% in females. The prevalence of astigmatism was 43.9% in males and 56.09% in females (Table 7).

DISCUSSION

- In India as in other developing countries, the school health services provided are quite insufficient contrary to services provided in developed countries. India being a developing country, there is shortage of infrastructure and resources.

Table 3: Distribution of uncorrected, presenting, and best corrected VA

VA	n (%)		
	Unaided	Presenting	BCVA
6/6	567 (88.31)	586 (91.27)	636 (99.06)
6/9-6/12	45 (7)	42 (6.54)	4 (0.62)
6/18-6/60	17 (2.64)	10 (1.55)	2 (0.31)
<6/60	13 (2.02)	3 (0.46)	0

BCVA: Best-corrected visual acuity, VA: Visual acuity

Table 4: Prevalence of refractive error by age and sex

Age (years)	Refractive error absent	Refractive error present
5-7	74	3 (3.8)
8-10	155	12 (7.2)
11-13	179	26 (12.7)
14-16	159	34 (17.6)
Males	298	42 (12.35)
Females	269	33 (10.92)
Total	567	75 (11.6)

Table 5: Distribution of type of refractive errors among cases and the study group

Type of refractive error	Number of students	Percentage among the cases	Percentage in study group
Myopia	28	36.9	4.36
Hypermetropia	6	8.3	0.93
Astigmatism	41	54.8	6.38
Total	75	100	11.6

Table 6: Association of age with the type of refractive error

Age (years)	Myopia n=28 (%)	Hypermetropia n=6 (%)	Astigmatism n=41 (%)	P
5-7	3 (8.6)	52.3	34.9	<0.05
8-10	5 (19.7)	28.6	26.6	
11-13	8 (29)	12.5	22	
14-16	12 (42.7)	6.6	16.5	

Table 7: Association of sex with the type of refractive error

Sex	Myopia n=28 (%)	Hypermetropia n=6	Astigmatism n=41	P
Male	16 (57.1)	4 (66.6)	18 (43.9)	P>0.05
Female	12 (42.8)	2 (33.3)	23 (56.09)	

- To implement Vision 2020 in India, childhood blindness has to be targeted and for that school eye screening program is a must there.
- Data on prevalence and causes of blindness in children is needed for planning and evaluating preventive and curative services for children.

- Among various eye disorders in schoolchildren, prevalence of refractive error in this study was 11.6% which was slightly lesser to prevalence observed by Shakeel *et al.* in Dehradun (13%)⁵ and Sharma *et al.*⁶ in Haryana (13.65%). However, due to differences in demographic factors, socioeconomic factors, different race, etc., prevalence in this study is higher when compared to that by Murthy *et al.*⁷ in New Delhi (6.4%) and Kumar *et al.*⁸ in Lucknow (7.4%). Variations in prevalence data were observed from different parts of the world also like 8.2% in Baltimore, the USA;⁹ 12.8% in Shunyi district in China;¹⁰ 2.9% in Nepal¹¹ and 15.8% in Chile.¹²
- There was an increase in overall prevalence of refractive errors with advancing age as shown in Table 4. Our results were comparable with the study conducted by Shakeel *et al.*, Dehradun⁵ which showed prevalence of refractive error more in 14-16 years age group (16.1%) as compared to 9.1% in 5-7 years age group. Pavithra *et al.*¹³ in Bengaluru showed the prevalence of refractive error higher in 13-15 years age group (7.5%) as compared to 6.6% in 7-9 years age group. Matta *et al.*¹⁴ 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 *et al.* in Andhra Pradesh¹⁵ and Krisnan *et al.* in Villupuram and Puducherry,¹⁶ where no sex predilection of refractive error was seen. However, some studies showed evidence of increased prevalence in female students,^{6,17} which can be due to earlier puberty in girls with respect to boys. This was in contrast to Sriram and Raj¹⁸ 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 Shakeel *et al.* in Dehradun⁵ were also the most common refractive error among schoolchildren was astigmatism (54.3%), followed by myopia (38.1%) and then hypermetropia (7.6%). Rai *et al.* in Rupendehi district, Nepal¹⁹ have also shown similar results. Pavithra *et al.* in Bengaluru,¹³ Sethi and Kartha Ahmedabad²⁰ and Matta *et al.*¹⁴ concluded that myopia was the most common refractive error among schoolchildren followed by astigmatism and hypermetropia. Medi and Robert in Kampala district showed that commonest refractive error was astigmatism (52%) followed by hypermetropia (37%) and myopia (11%).²¹
- 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 Dehradun,⁵ New Delhi,⁷ Bengaluru,¹³ Andhra Pradesh,¹⁵ and Kolkata.²² 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.¹⁶ Hypermetropia was shown to be associated with female sex in some of the previous studies.^{7,13,23} In a study conducted by Pune,²⁴ 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%) in a study conducted in Kolkata.²² Myopia was shown to have no sex predilection in few other studies.^{13,15} Study conducted by Shakeel *et al.*⁵ has also shown that myopia has increasing trend with age whereas hypermetropia and astigmatism have decreasing trend with age.

- The presenting VA was 6/6 in 91.27% students while after refractive correction 99.06% students could attain a VA of 6/6. These results raise the need for school-based program that provides prescription of glasses to the deserving students at no cost, through government and non-governmental collaborative fund due to shortage of resources and insufficient facilities in India, School Health Services are hardly more than a token service.²⁵
- 2 (0.31%) students in our study suffered from amblyopia. Amblyopia treatment is most effective when done early in the child's life, usually before 7 years of age.²⁶ School screening is the best way to detect amblyopia in schoolchildren. Since detailed evaluation was done only in children with VA <6/12, some refractive errors like latent hypermetropia might have been missed. Moreover, students with manifest strabismus and pathological myopia were excluded from this study which might distort the demographic data marginally. Another limitation of our study was that only schoolgoing children were included in the study though some proportion of children in Rural India and other developing countries do not go to school. Hence, a more complete assessment of visual impairment in children would be possible with population-based studies not restricted only to schoolgoing children.
- Different studies conducted in India and world over suggest early screening, spectacle compliance, and spreading awareness among parents to motivate students to use spectacles.²⁷

CONCLUSION

Refractive error is a common cause of visual impairment among schoolchildren in developing countries. Uncorrected refractive errors can cause immediate and long-term consequences in children and adults such as lost educational and employment opportunities, reduced economic gain for individuals, families, and societies with impaired quality of life. Various factors are responsible for refractive errors remaining uncorrected in children like 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. School eye screening program need to be implemented on a large scale to detect children suffering from blindness due to refractive error.

REFERENCES

1. Alam H, Siddiqui MI, Jafri SI, Khan AS, Ahmed SI, Jafar M. Prevalence of refractive error in school children of Karachi. *J Pak Med Assoc* 2008;58:322-5.
2. Smith TS, Frick KD, Holden BA, Fricke TR, Naidoo KS. Potential lost productivity resulting from the global burden of uncorrected refractive error. *Bull World Health Organ* 2009;87:431-7.
3. Park K. Textbook of PSM. 24th ed. Jabalpur: M/S Banarasi Dass Banot; 2017. p. 458-60.
4. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, *et al.* Causes of vision loss worldwide, 1990-2010: A systematic analysis. *Lancet Glob Health* 2013;1:e339-49.
5. Shakeel T, Mittal SK. Pattern of refractive errors in primary school children in Dehradun city of Uttarakhand state Delhi. *J Ophthalmol* 2016;27:106-10.
6. Sharma S, Vashisht BM, Kalhan M, Goel M. Magnitude of refractive errors among school children in a rural block of Haryana. *Internet J Epidemiol* 2009;6:5.
7. Murthy GV, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, Sanga L, *et al.* Refractive error in children in an urban population in New Delhi. *Invest Ophthalmol Vis Sci* 2002;43:623-1.
8. Kumar JV, Singh PC, Ahuja J, Mohan U. Ocular morbidity among school children in Sarojini Nagar Lucknow. *Indian J Community Med* 1992;17:109-3.
9. Proslan M, Novak C. The baltimore vision screening project. *Ophthalmology* 1996;103:105-9.
10. Zhao J, Pan X, Sui R, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: Results from Shunyi District, China. *Am J Ophthalmol* 2000;129:427-35.
11. Pokharel GP, Negrel AD, Munoz SR, Ellwein LB. Refractive error study in children: Results from Mechi Zone, Nepal. *Am J Ophthalmol* 2000;129:436-4.
12. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: Results from La Florida, Chile. *Am J Ophthalmol* 2000;129:445-4.
13. Pavithra MV, Maheshwaram R, Sujatha MA. A study on the prevalence of refractive errors among school children of 7-15 years age group in field practice areas of a medical college in Bangalore. *Int J Med Sci Public Health* 2013;2:641-5.
14. Matta S, Matta P, Gupta V, Dev A. Refractive errors among adolescents attending ophthalmic OPD. *Ind J Community Med* 2006;31:114.
15. Ande VR, Peeta RK, Chella MR, Gujjarlalpuudi C, Murthy GV, Gupta SK, *et al.* Prevalence of refractive errors among school children in rural setting. *MedPulse Int Med J* 2015;2:98-101.
16. Krisnan VM, Baba D, Poovitha R, Kumar PS. Study of prevalence of

Hashia and Slathia: Pattern of Refractive Errors in Primary Schoolchildren in Rural Areas of Jammu

- refractive error in school children of Villipuram and Puducherry. *Sch J App Med Sci* 2015;3:2568-73.
17. Prema N. Prevalence of refractive error in school children. *Ind J Sci Technol* 2011;4:1160-1.
 18. Sriram C, Raj J. A cross-sectional study on prevalence of refractive errors among school children in Thiruvallur district, Tamil Nadu. *Indian J Appl Res* 2014;4:2249-55.
 19. Rai SK, Thapa HB, Gurung N, Bhari AM, Sharma MK. Pattern of refractive error in primary school children in Rupandehi district, Nepal. *J Univers Coll Med Sci* 2015;3:31-6.
 20. Sethi S, Kartha GP. Prevalence of refractive errors among school children (12-17 years of Ahmedabad city). *Ind J Community Med* 2000;25:181-3.
 21. Medi K, Robert M. A survey of prevalence of refractive errors among children in lower primary schools in Kampala district, Uganda. *Afr Health Sci* 2002;2:69-72.
 22. Chatterje S, Biswas D, Kumar K. Prevalence of refractive errors in school children in the urban population of Kolkata, India. A prospective study. *Int J Res Health Sci* 2014;2:1185-7.
 23. Kalikivayi V, Naduvilath TJ, Bansal AK, Dandona L. Visual impairment in school children in southern India. *Indian J Ophthalmol* 1997;45:129-34.
 24. Kumar P, Pore P, Dixit AK, Singh N. Prevalence and demographic distribution of refractory error in school children of Pune, India. *Int J Res Health Sci* 2014;2:58-67.
 25. Pararajasegaram R. VISION 2020-the right to sight: From strategies to action. *Am J Ophthalmol* 1999;128:359-60.
 26. Khurana AK. *Textbook of Ophthalmology*. 3rd ed. New Delhi: New Age International Publisher; 2006. p. 52-9.
 27. Gogate P, Mukhopadhyaya D, Mahadik A, Naduvilath TJ, Sane S, Shinde A, *et al*. Spectacle compliance amongst rural secondary school children in Pune district, India. *Indian J Ophthalmol* 2013;61:8-12.

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