



Prevalence and Determinants of Refractive Errors among School Children of 5th -10th Standard: A Study from South Kerala

Vincy Nelson¹, Girija Viswanathan², Sony Simon³

Financial Support: None declared
Conflict of Interest: None declared
Copy Right: The Journal retains the copyrights of this article. However, reproduction is permissible with due acknowledgement of the source.

How to cite this article:

Nelson V, Viswanathan G, Simon S. Prevalence and Determinants of Refractive Errors among School Children of 5th -10th Standard: A Study from South Kerala. Natl J Community Med 2018;9(11):813-818

Author's Affiliation:

¹Assoc Prof, Dept of Community Medicine, Travancore Medical College, Kollam, Kerala; ²Professor & Principal, Dept of Community Medicine, Sree gokulam medical college & RF, Trivandrum; ³Asst Professor, Dept of Community Medicine, Travancore Medical College, Kollam, Kerala

Correspondence

Dr. Vincy Nelson
drvincy@rediffmail.com

Date of Submission: 06-03-18

Date of Acceptance: 28-11-18

Date of Publication: 30-11-18

ABSTRACT

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

Objectives: This study was carried out to assess the prevalence and determinants of refractive errors among school children of 5th-10th standard.

Materials & Methods: Study Design: cross sectional study Sampling technique: stratified random sampling. Study participants: A total of 1020 students were included in the study. 510 students from each school. All students were screened for defective vision with the help of Snellen's chart and optometrist confirmed the findings. Data was analysed to find the prevalence of refractive errors and also to find the determinants using percentages and chi-square tests.

Results: 21.7% of students were found to have refractive errors. Children residing in the urban area (24.6%) were found to have more refractive errors compared to children residing in rural area (18.6%). Family history of refractive error was significantly associated with prevalence of refractive errors. ($p < 0.001$).

Conclusion: Boys were having higher prevalence of refractive errors compared to girls. Myopia was the most common form of refractive error. Regular eye screening should be done in school level. IEC activities should play a major role in eye health.

Keywords: Prevalence, Refractive error, School children, Age, Myopia

INTRODUCTION

Human eye is a wonderful organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the other four senses. The objective of learning begins in childhood and accuracy of a child's vision can immensely affect his/her learning capacity. It helps in determining the future of an individual, in which eye sight has a great role to play. Moreover, planning of a youth's career is very much dependent on the visual acuity, especially in jobs for navy, military, railways and aviation¹. This warrants early detection and treatment of refractive errors to prevent permanent disability.

According to WHO Bulletin in 2010, it was estimated that more than 285 million people were visually impaired worldwide, of whom 246 million people had low vision and 39 million were blind. Among the blind people 1.4 million are children below 16 years of age^{2,3} India alone has more than 62 million people with visual impairment, of whom 8 million are blind. Approximately three-quarters of the blind children in the world live in the poorest regions of Africa and Asia⁴.

About 13% of Indian population is in the age group of 7-15 years, 20% of children develop refractive error by the age of 16 years and 6-7% of children in the age group of 10-15 years in India

have refractive errors affecting their learning⁵. Considering the fact that 30% of India's blind lose their eyesight before the age of 20 years and many of them are under five when they become blind, early detection and treatment of visual impairment among young children is important.

Uncorrected refractive errors are a major cause of blindness and low vision. It is estimated that 145 million have low vision because of lack of refractive correction.⁶ This finding is significant considering that refractive error can be easily diagnosed and spectacle correction is among the most cost-effective intervention in eye care. It is the second cause of blindness after cataract and the main cause of low vision. Overall, they are the cause of almost half of all visual impairment.

Studies indicate that visual impairment and blindness in children can have a significant impact on their performance at school as well as their social interaction and development. Loss of vision in children can influence their educational opportunities, future employment, and social life⁷. Their consequences are an important public health issue with greater impact in developing countries, where 80% of the blindness in children occurs⁸. Even though the actual number of blind children being much smaller than that of adults worldwide, the number of blind years resulting from blindness in children.. Children in the school-going age group (6-16 years) represent 25% of the population in the developing countries¹⁰. Schools are the best centers for effectively implementing the comprehensive eye health care programme. Hence, this study was conducted to find out the prevalence and determinants of Refractive errors among school children from 5th -10th std.

OBJECTIVES

The study was conducted to find out the prevalence of refractive errors among school children of 5th -10th standard and also to find out the determinants of refractive errors among school children of 5th -10th standard.

MATERIALS & METHODS

This was a cross sectional study done in one government and one private school which was selected randomly. There were a total of 6369 school Children studying from 5th -10th std in attingal Schools. From the total six schools two schools were randomly selected. The study was conducted in Government High School, Avanavancherry and Sree Gokulam Public School, Attingal which belonged to the field practice area of the medical college. Study population included School children of

5th-10th std belonging to Government and Private Schools. Period of study was from December 2011 to November 2013. Stratified random sampling was used for sampling technique.

Sample size: As per pilot study conducted, the prevalence of Refractive Error was found to be 10%, sample size calculated as 900.fixed it as 1000, total of 500 students from each school. Consent was taken from the concerned School Authorities. Written Consent taken from the Headmasters and from the Parent Teacher Association (PTA) of the concerned schools and lastly oral consent from the participants of the study.

Study started only after clearance from the Institutional Ethics Committee.

Inclusion criteria: All the children from 5th -10th std of selected schools in the urban field practice area of Sree Gokulam Medical College.

Table 1: Table showing the profile of refractive errors

Characteristics	Students (%)
Refractive error	
Present	221 (21.7)
Absent	799 (78.3)
Type of cases of Refractive errors (n=221)	
Old cases	111 (10.9)
Newly detected cases	110 (10.8)
Type of Refractive error (old cases) (n=111)	
Myopia	70 (0.631)
Myopic Astigmatism	9 (0.081)
Hypermetropia	0 (0)
HypermetropicAstigmatism	3 (0.027)
Astigmatism	26 (0.234)
Mixed Astigmatism	3 (0.027)
Type of Refractive error (new cases) (n=110)	
Myopia	51 (0.464)
Myopic Astigmatism	15 (0.136)
Hypermetropia	3 (0.027)
HypermetropicAstigmatism	2 (0.018)
Astigmatism	39 (0.355)
Mixed Astigmatism	0 (0)
Type of Refractive error (Total population) (n=221)	
Myopia	121 (54.8)
Myopic Astigmatism	24 (10.9)
Hypermetropia	3 (1.4)
HypermetropicAstigmatism	5 (2.3)
Astigmatism	65 (29.4)
Mixed Astigmatism	3 (1.4)
Power of eyes in diopters (n=221)	
0.5-1 D	102 (0.462)
>1- 3 D	97 (0.438)
>3- 5 D	16 (0.072)
>5 D	6 (0.028)
Different type of ocular problems (n=1020)	
Normal vision	799 (0.783)
Only refractive error	216 (0.212)
Squint	2 (0.002)
Bitots spots	1 (0.001)
Nystagmus	1 (0.001)
Retinal detachment	1 (0.001)

All schools in the urban field practice were listed. Among them two schools were selected randomly. From each school, students from 5th -10th std were selected using stratified random sampling. Each standard was taken as a strata and a particular division (A,B,C,D,E) was selected randomly by teachers. All students of that division present on day of examination were included in the study. 510 students from each school were included in the study. Permission for the study and written consent was taken from the Head masters and parent teacher associations of the concerned schools. A date was fixed for screening from each school. A pilot study was conducted in the urban field practice area and questionnaire was finalized after corrections to collect information from the students. Education and socio-economic status of students could not be taken since the information may not be reliable.

Students were screened in their respective class rooms. Screening was done using Snellen's chart. From 6m distance the student was shown the Snellen chart and was asked to read. Students with visual acuity with less < 6/9 were sent subjective refraction. Subjective refraction was done till best corrected visual acuity was obtained. cyclopegeic refraction was done for students among whom the best corrected visual acuity cannot be obtained.

RESULTS

A total of 1020 students were taken as study participants from two schools, 510 from each school. Males were 557(54.6%) and females 463(45.4%).495 (48.5%) were from rural area and 525 (51.5%) were from urban area. Majority of the students belonged to the age group of 12.7±1.69 years.

Table 2: Association between refractive errors and socio-demographic variables

Variables	Refractive error		Chi square (χ ²) value	p value
	Present (%)	Absent (%)		
Age				
10 years	27 (12.21)	109 (13.64)	7.840	0.165
11 years	32 (14.48)	110 (13.76)		
12 years	22 (9.95)	120 (15.01)		
13 years	38 (17.9)	160 (20.02)		
14 years	46 (20.81)	145 (18.15)		
15 years	56 (25.34)	155 (19.39)		
Gender				
Boys	132 (23.7)	425 (76.3)	2.984	0.084
Girls	89 (19.2)	374 (80.8)		
Place of residence				
Rural	92 (18.6)	403 (81.4)	5.38	<0.001
Urban	129 (24.6)	396 (75.4)		
School Type	Refractive error	Normal vision		
Government	99 (19.4)	411 (80.6)	3.055	0.080
Private	122 (23.9)	388 (76.1)		
Family history of refractive errors	Defective vision	Normal vision		
Present	136 (41.6)	191 (58.4)	112.57	<0.001
Absent	85 (12.3)	608 (87.7)		

Table 3: Association between refractive error and different symptoms

Ocular Symptoms	Refractive errors		Chi square (χ ²) value	p value
	Present (%)	Absent (%)		
Blurring of vision				
Yes	141 (95.3)	7 (4.7)	552.59	<0.001
No	80 (9.2)	792 (90.8)		
Difficulty in seeing near objects	Present	Absent		
Yes	46 (92)	4 (8)	153.24	<0.001
No	175 (18)	795 (82)		
Difficulty in seeing far objects	Present	Absent		
Yes	160 (97)	5 (3)	657.66	<0.001
No	61 (7.1)	794 (92.9)		
Eye fatigue/eye strain	Present	Absent		
Yes	100 (70.9)	41 (29.1)	233.88	<0.001
No	121 (13.8)	758 (86.2)		
Headache	Present	Absent		
Yes	122 (67.8)	58 (32.2)	273.82	<0.001
No	99 (11.8)	741 (88.2)		

Table 6: Table showing association between various variables and refractive error

Variables	Refractive errors		Chi square (χ^2) value	p value
	Present (%)	Absent (%)		
Position of light while reading				
From front	134 (23.5)	436 (76.5)	2.58	>0.05
From back	87 (19.3)	363 (80.7)		
Position of holding books				
Normal arms length (33cm)	139 (16.8)	686 (83.2)	66.03	<0.001
Very near (<33cm)	68 (46.6)	78 (53.4)		
Very far (>33cm)	14 (28.6)	35 (71.4)		
Posture of reading				
Upright posture	182 (22.9)	612 (77.1)	3.33	0.068
Lying down posture	39 (17.3)	187 (82.7)		
Source of illumination				
Candle	4 (36.4)	7 (63.6)	1.45	0.485
Bulb	72 (21.2)	268 (78.8)		
Tube	145 (21.7)	524 (78.3)		
Duration of TV watching				
>5 hours weekly	113 (22.8)	382 (77.2)	5.03	0.081
2-5 hours weekly	81 (23.2)	268 (76.8)		
< 2 hours weekly	27 (15.3)	149 (84.7)		
Outdoor sports activity				
Absent	133 (31.8)	285 (68.2)	43.00	<0.001
Present	88 (14.6)	514 (85.4)		

DISCUSSION

Prevalence of refractive error: The prevalence of refractive error in the present study was found to be 21.7%. The overall prevalence in India has been reported to vary between 21% and 25% in patients attending eye outpatient departments¹¹. A study by Jabeen Rohul et al in Kashmir, India found 54.6% of adolescents attending preventive ophthalmology clinic of community medicine had refractive errors.¹² In another study done by Sonam Sethi et al in Ahmadabad the prevalence of Refractive error was found to be 25.32%.¹³ In another study by Dandona et al, done in a rural population of Andhra Pradesh, Prevalence of refractive error was 61%.¹⁴ S Matta et al, in their study among the adolescents attending ophthalmology OPD, observed a prevalence of refractive error of 12.5%.¹⁵ In a study conducted by Ayub ali et al, Lahore the prevalence of refractive error was 19.8%¹⁶, and in another study by Madhu gupta et al Shimla prevalence of refractive error was 22%.¹⁷

Prevalence and Age: Mean age of the study population in the present study was 12.78 years with standard deviation of 1.693. This was similar to the study by Sonam Sethi et al, Ahmedabad among school children, in which the mean age was found to be 13.22 years.¹³

The present study showed an increasing trend in the prevalence of myopia and astigmatism as age advances. In a similar study by S Matta et al among adolescents attending ophthalmology OPD, they found that refractive error increased with increasing age especially in 10-14 years.¹⁵ In another study by Dandona et al found a gradual shift to-

wards less positive values of refractive error occurred with increasing age in both boys and girls.¹⁴

Prevalence and gender: In the present study prevalence of refractive errors were more common among male gender (23.7%) compared to female gender (19.2%). In a study conducted by S Matta et al among the adolescents attending ophthalmology OPD also found that refractive errors were more common in males compared to females.¹⁵ In a study conducted in Shimla by Madhu Gupta et al among school children could find only marginal difference between males and females in the prevalence of refractive errors

Prevalence and place of residence: In the present study prevalence of refractive error was more among the children coming from urban area 24.6% compared to rural area 18.6%. Prevalence of refractive error was significantly high ($p=0.020$) in the urban area.

In a study conducted by Amrutha S Padhye et al a higher prevalence of 5.46% was reported among the children in the urban area compared to 2.63% in rural area in their study on prevalence of uncorrected refractive error and other eye problems among rural and urban school children of Maharashtra.²⁰

Prevalence in school settings: Present study showed that the prevalence of refractive error among private school children (23.9%) was more compared to children belonging to government schools (19.4%).

In a study done by Ayub Ali et al, Lahore on the prevalence of refractive errors they found that the

children belonging to private schools (23.3%) were having more refractive errors when compared to government school children (16.3%)¹⁶.

In another study by Madhu Guptha et al, Shimla also found out that the prevalence of refractive error was more among the private school children (22.6%) compared to government school children (21.5%)¹⁷.

Many studies states the prevalence of refractive errors among private school children is more, probably due to the life style associated with better socioeconomic conditions eg: socio economic status of the students, television and computer use, close study, living styles and more chance to get education. However confirmatory information on contributing factors is lacking.

Prevalence and family history: In the present study association between family history and occurrence of refractive errors was found to be significant ($p < 0.01$ level). 41.6% of students with refractive errors were having a positive family history when compared to 12.3% with no family history of refractive errors.

In a similar study by Ayub Ali et al, Lahore on prevalence of uncorrected refractive errors among school children they found out that 57% students who have refractive errors had a positive family history¹⁶.

Prevalence and type of refractive errors: Present study reported an increased prevalence of myopia (54.8%) among school children and it was seen that myopia increased with age. Astigmatism (44%) was the second most common cause of refractive error, which includes myopic, hypermetropic and mixed astigmatism. Hypermetropia was noted only in 1.4% of students.

In another study by Sonam Sethi et al in Ahmedabad, they found that 63.3% of students with refractive error had Myopia, 11.4% had hypermetropia and 20.4% had astigmatism¹³. In another study by Matta et al, in New Delhi among the adolescents attending outpatient department of ophthalmology found that out of 124 children with refractive error 55.6% had myopia, astigmatism was prevalent in 27.4% of the cases and hypermetropia was seen in 16.9% of the cases¹³.

Symptoms and Visual Hygiene: In the present study majority of students with refractive errors complained of difficulty in seeing far objects, blurring of vision, headache while reading, eye fatigue and strain.

In a study conducted by A Saad et al, they found out that past history of ocular problems was found in 24% of the students with refractive errors, in the form of symptoms like eye strain, headache, diffi-

culty in reading blackboard, redness of eye²¹.

Visual hygiene is an area where major research work was not carried out. The present study also tried to find out whether any relation exists between the posture of reading, source of light while reading, duration of hours of watching TV/computer/video games, presence of outdoor sports activity and refractive errors. In the present study only 16.8% of students with refractive errors were holding books in the normal arm length (33 cm). Most of the students were using tube light as source of illumination for reading, hence no significant association was found between source of light and refractive errors. In the present study 22.9% students with refractive errors were found to be watching TV for more than 5 hours per week, but this association was not found to be statistically significant. Present study could find significant association between outdoor sports activity and occurrence of refractive errors. The students with regular outdoor activity has decreased occurrence of refractive errors and was found to be statistically significant. ($p < 0.001$).

Saw SM et al, Singapore in a cross sectional study found out a positive association between myopia and near work activity such as reading and writing²².

In another study by Ayub Ali et al, Lahore found out that there is very strong relationship between close study and refractive errors. They also found out that there is a strong correlation between studying in dim light and refractive errors¹⁶.

CONCLUSION

The prevalence of Refractive error in this Study was found to be more than the Indian standards. Prevalence of refractive error among private school students was found to be more than the Government school students. Even though Kerala State is highly educated the parents are not much aware of the importance of eye health, especially in the government schools. Prevalence of refractive error among students coming from urban area was more when compared to children coming from rural area. Students who were involved in the outdoor games were not having much of refractive errors. Majority of the students were engaged in the Indoor games, TV, Laptops, Video games etc which can affect their vision.

RECOMMENDATIONS

Refractive error being the second commonest cause of blindness has a significant role to play in the future of the child. It determines education and

development of the child. Hence early detection and prompt treatment is necessary and school health services must work effectively to eliminate this easily treatable cause of blindness.

REFERENCES

- Mukherjee R, Seal SC: An epidemiological study of refractive errors among school children in Calcutta, JIMA 1979; 72 (10):159-64.
- World Health Organisation. Preventing blindness in children. Report of a WHO/IAPB Scientific meeting. WHO/PBL/00.77. Geneva: WHO, 2000.
- Shamanna B.R. Murali Krishnan R. Childhood cataract: Magnitude, management, Economics and impact. J Common Eye Health 2004; 17(50):17-18.
- Gilbert C, Foster A. Childhood blindness in the context of VISION 2020---The Right to Sight. Bulletin of the World Health Organization, 2001, 79: 227-232.
- Government of India (2004), Annual report 2003 2004, ministry of health and family welfare, New Delhi.
- Resnikoff S, Pascolini D, Mariotti S P, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull World Health Org 2008; 86(1): 63-70.
- Harsha B, Kalyan D. et al. Causes of childhood blindness in the north eastern states of India; Indian J Ophthalmol 2008; 56(6): 495-499
- Rahi JS, Cable N. Severe visual impairment and blindness in children in the UK. Lancet. 2003 Oct 25; 362(9393):1359-65.
- World Health Organization, The State of the World's Sight, 2005. VISION 2020: The Right to Sight. 1995-2005.
- Parikshit G, Mohammad M. Blindness and cataract in children in developing countries. Community Eye Health Journal 2009; 22(69) 4-5.
- Goswami A, Ahamed E, Shaha PL, Roy IS. An epidemiological pattern of cases of refractive errors. J Indian Med Assoc 1978; 28:217-20.
- Jabeen Rohul, Aakifa Maqbool, Syed Arshad Hussain, Hamid Shamila, Fazli et al. Prevalence of Refractive error in outpatient attendees of the preventive ophthalmology clinic of community medicine. NUJHS. 2013; 3(1); 17-20
- Sethi S, Kartha GP. Prevalence of refractive errors among school children (12-17 years) of Ahmedabad city. Ind Journal of Com Med, 2000; 25: 181-83.
- Dandona, R, Dandona, L, Srinivas, M, et al. Refractive error in children in a rural population in India Invest Ophthalmol Vis Sci 2002; 43: 615-622.
- Matta S, Matta P, Gupta V, Dev A. Refractive errors among adolescents attending Ophthalmic OPD; Ind Journ Comm Medicine. 2006-04 - 2005-06; 31(2).
- Ayub Ali, Imran Ahmad, Saima Ayub. Prevalence of undetected refractive error among school children of Lahore. Biomedica 2007; 23:96-101.
- Madhu Gupta, Bhupinder P Gupta, Anil Chauhan, Asok Bhardwaj. Ocular morbidity prevalence among school children in Shimla. Indian Journal of Ophthalmol. 2009; 57(2): 133-138
- Venkatramana K. Naduvilam T. Visual impairment in School children in Southern India, Ind. journal. of Ophthalmol; 1997:129-34
- Kalkivayi V, Naduvilah TI, Bansal AK, Dandona L. Visual impairment in school children in Southern India. Indian J Ophthalmology 1997; 45: 129-34.
- Padhye S A et al. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. Middle East African Journal of ophthalmology. 2009; 16(2) 69-74.
- A. Saad, B.M. EL, Bayoumy. Environmental risk factors for refractive errors among Egyptian school children. Eastern Mediterranean Health journal 2007; 13:112-117.
- Saw SM, Hong RZ, Zhang MZ, Fu ZF, Ye M, Tan D, Chew SJ. Near-work activity and myopia in rural and urban school children in China. J Pediatr Ophthalmol Strabismus 2001; 38:149-55.