ORIGINAL RESEARCH ARTICLE
pISSN 0976 3325 | eISSN 2229 6816
Open Access Article
www.njcmindia.org

Factors Associated with Refractive Errors among School Children in Rural Field Practice Area of a Tertiary Care Hospital, Bangalore

Usha S[1], Vidusha S S Karavadi[2], Damayanthi M N[3]

Financial Support: None declared
Conflict of Interest: None declared

How to cite this article:
Usha S, Karavadi VS, Damayanthi M N. Factors Associated with Refractive Errors among Schoolchildren in Rural Field Practice Area of a Tertiary Care Hospital, Bangalore. Natl J Community Med 2018;9(11):824-829

Author's Affiliation:
[1]Associate Professor; [2]Assistant Professor, Dept Community Medicine, Rajarajeswari Medical College and Hospital , Benguluru; [3]Professor, Dept Community Medicine, Chamrajanagar Institute of Medical Sciences, Chamrajanagar

Correspondence
Dr Karavadi Sri Sai Vidusha
k.vidusha@gmail.com

Date of Submission: 26-09-18
Date of Acceptance: 28-11-18
Date of Publication: 30-11-18

ABSTRACT

Background: 285 million people are visually impaired worldwide. An estimated 19 million children are visually impaired, and 12million are visually impaired due to Refractive Errors. Children in school going age group fall in preventable age group for correction of Refractive Errors. The study was conducted to determine the factors associated with refractive errors among schoolchildren in rural field practice area of Rajarajeswari Medical College and Hospital, Bangalore.

Methodology: A cross sectional study conducted among school children in age group of 7-15yrs.School children of age 7-15 yrs were examined for defective vision using Snellen's chart. General information of the children was collected using a pre-designed and semi- structured questionnaire Children with abnormal vision were referred to hospital.

Results: 1140 study participants were examined where the mean age was 11.28years.The prevalence of Refractive Errors was 10.5%.The prevalence of Refractive Errors was significantly associated with age ($p<0.05$). The association between family history and Refractive Errors was statistically significant with $p <0.001$.

Conclusion: The Prevalence of Refractive Errors, especially myopia, was higher in older children. Causes of higher prevalence and barriers to Refractive Error correction services and compliance should be identified and addressed. Eye screening of school children is recommended.

Keywords: Refractive Errors, School children, Myopia, Family history

INTRODUCTION

Visual impairment is a significant public health problem. 19 million children are estimated to be visually impaired. Among these children, 12 million are visually impaired due to Refractive Errors a condition which could be easily diagnosed and corrected[1]. It is estimated that there are 1.4 million blind children in the world. Two thirds of these live in the developing countries, and of all the blind children 2,70,000 live in India. Uncorrected Refractive Errors are responsible for 19.7% of blindness. About 13% of Indian population is in the age group of 7-15yrs.By the age of16years and about 20% of children develop Refractive Error [2].

Children are the valuable assets of a country. As reported by World Health Statistics 2014, children under 15years age group constitute 29% of Indian population[3].The school age is a formative period, physically as well as mentally. School age transforms the child into a promising adult[4].

Vision problems are one of the common problems among school-age kids. There are many reasons like unhygienic living conditions, malnourishment

and the alluring media influence like television, computer games and diminishing parental care etc. Children who have vision problems could not concentrate on studies or on any other extracurricular or recreational activities[5].

Children are at high risk of developing Refractive Errors, as they are actively growing and they are subjected to the strain of near work due to demanding academic schedules. Children do not complain of defective vision, and sometimes may not even be aware of the condition[4]. Eye problems in children are not detected unless looked for. Unlike adults children are unaware of their problems and rarely complain. The complaints of the child to the parents go unnoticed due to lack of awareness, more in the rural areas[4].

Childhood blindness is one of the main priorities in Vision 2020: The Right to Sight. Correction of Refractive Errors is included in the strategy for the elimination of avoidable visual impairment and blindness[6].Limited studies are available regarding factors associated with Refractive Errors in rural area, hence the present study was undertaken an effort was done to determine the factors associated with refractive errors among schoolchildren in rural field practice area of Rajarajeswari Medical College and Hospital, Bangalore.

METHODS

A cross sectional study was conducted among all the Government schools of rural field practice area of Rajarajeswari Medical College and Hospital Bangalore during November 2013- July 2015. All the school going Children in the age groups of 7-15 years from 18 schools present on the day of the study were included in the study.

Sample size: The sample size of 1077 was calculated by considering the prevalence of refractive errors of 27.08% (Prema N[5]) and with allowable error as 10% by using the formula $n= 4pq/L^2$. However complete enumeration i.e.1140 students were studied

Methodology: A pilot study was conducted before the actual study, following which necessary changes were incorporated in the questionnaire. This data has been excluded from the main study.

All the schools were enlisted and selected by simple random sampling. Permission was obtained from school authorities to conduct the study.

Operational definitions

Refractive error: There are three major types of refractive errors: a) Myopia or short sightedness was considered when the measured refraction was more than or equal to −0.5 spherical equivalent diopters in one or both eyes; b) Hypermetropia or long sightedness was considered when the measured objective refraction was greater than or equal to +1.00 spherical equivalent diopters in one or both eyes; and c) Astigmatism was considered to be visually significant if ≥1.00 D.

Defective vision: Children who can read the 6/9 line are labeled as normal while those who cannot read this line with any eye are labeled as abnormal. According to school eye screening programme myopic correction is for school children.

Jaeger's chart will be held at a distance of 14 inches and children who cannot read N9 line will be labeled abnormal.

General information of the children was collected using pre-designed and semi- structured questionnaire after taking informed consent. The study variables included Socio-demographic profile and questions related to Family history, Regular use of spectacles.

Snellen's chart in English and Kannada was used on the basis of the students' preference.2nd and 3rd standard children who could not read the Snellens were assessed with the E charts or picture chart. The vision was tested for each eye separately. The cut off level of visual acuity to denote failure was fixed at less than 6/9 in either eye.

A well illuminated class room was chosen in each school and the students were made to stand at a distance of 6 meters from the chart hung on the wall. The vision was tested in each eye separately. If the student could not read even the top letters on the chart he was asked to read from a distance of 3 meters. Even if this was not possible finger counting and perception of light was tested. When one student was being tested the others were not allowed to watch this to prevent them from memorizing the letters beforehand.

Jaeger's chart (standard near vision chart) was used for testing near vision at a distance of 33 cm. Ishihara chart was used to test colour blindness.

The students with defective vision and other ocular problems were referred to Department of Ophthalmology in Rajarajeswari Medical College and Hospital. Cycloplegic examination was done who came to Department of Ophthalmology. The cycloplegic used is 1% cyclopentolate. After instilling the cyclopentolate 3-4 drops into both eyes, refraction was done after 2 hours with streak retinoscope. Objective refraction was performed with retinoscope which was followed by subjective refraction till the best corrected visual acuity was achieved. Subsequent glasses were prescribed for appropriate study participants.

Statistical analysis

The data was compiled in Microsoft (MS) Excel work sheet and analyzed using SPSS (Statistical Package for Social Sciences) software version 20.0.The descriptive statistics- All qualitative variables are presented as frequency and percentages. Chi-square test of significance was used to test the association between refractive errors and factors related to refractive errors and Fisher's exact test was used. p values of less than 0.05 were considered statistically significant.

RESULTS

A total of 1140 study participants were examined. The age of study participants ranged from 7 to 15yrs and mean age in years was 11.28±2.273. Females were 577 (50.6%) and males were 563 (49.4%) of the study subjects (Table 1). 226 (19.8%) of study subjects have family history of refractive errors.

The prevalence of refractive errors was observed 10.5%. Among the 120 study participants with refractive errors 82 of them came to Department of Ophthalmology for cycloplegic examination. Among the types of refractive errors majority i.e. 48 (58.5%) of them were Myopes. 20 (24.4%) of them were having Astigmatism. Hypermetropia was seen among 14 (17.1%) of the study subjects (Fig -1).

Among the study subjects with refractive errors, 85(12.2%) of them were in age group of 11-15yrs. The difference between age and refractive errors was found to be statistically significant. The refractive errors were more among females i.e 69 (57.5%) than males 51 (42.5%). In females the odds of having refractive errors was 1.3times more than males.

Table 1-Socio-Demographic profile of study participants

Variables	Frequency (n=1440) (%)
Age in years	
7-9	278 (24.4)
10-12	487 (42.7)
13-15	375 (32.9)
Gender	
Female	577 (50.6)
Male	563 (49.4)
Religion	
Hindu	1016 (89.1)
Muslim	112 (9.8)
Christian	11 (1.0)
Sikh	1 (0.1)
Class	
2nd-4th (Primary)	317 (27.8)
5th-7th (Middle)	449 (39.4)
8th-10th(High)	374 (32.8)

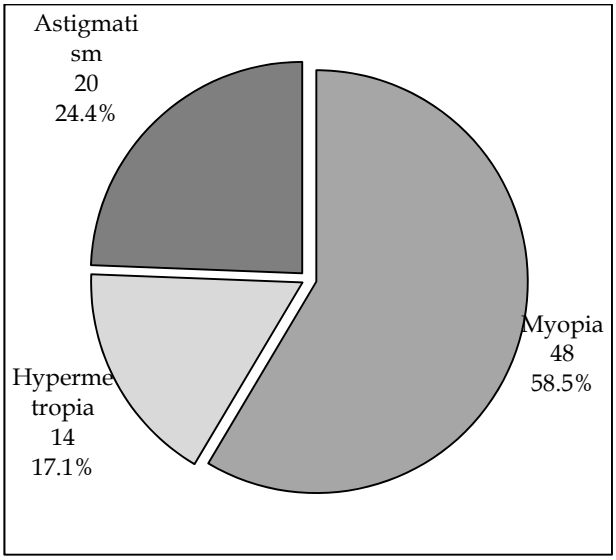

Figure 1: Distribution of study participants according to their types of Refractive Errors (n=82)

Table 2: Distribution of study participants with Refractive Errors according to their socio-demographic profile

Variables	Refractive error		Total	Chi-square value	df	p value	Odds Ratio	95% Confidence interval
	Present (n=120) (%)	Absent (n=1440)(%)						
Age (Years)								
7-10	35(29.2)	409 40.1)	444(**38.9**)	5.39	1	0.02	0.61	0.40-0.91
11-15	85(70.8)	611(59.9)	696(**61.1**)					
Gender							1.36	0.93-1.99
Female	69(57.5)	508(49.8)	577(50.60	2.54	1	0.11		
Male	51(42.5)	512(50.2)	563(49.4)					
Family history							2.14	1.42-3.24
Present	39(32.5)	187(18.3)	226(19.8)	13.557	**1**	0.0001		
Absent	81(67.5)	833(81.7)	914(80.2)					
Birth order							1.55	1.06-2.27
I	57(47.5)	376(36.9)	433(100)	5.157	**1**	0.02		
>I	63(52.5)	644(63.1)	707(100)					
Reading in dim light							1.24	0.85-1.82
Present	52(43.3)	38(38.1)	441(38.7)	0.43	**1**	0.835		
Absent	68(56.7)	631(61.9)	699(61.3)					

Table 3-Distribution of study participants with types of Refractive Errors according to their age and gender

Variables	Myopia (%)	Hypermetropia (%)	Astigmatism (%)	Refractive errors absent	Total (%)
Age (Years)					
7-10	10(2.3)	10(2.3)	4(0.9)	420(94.6)	444(100)
11-15	38(5.5)	4(0.6)	14(2.0)	640(92)	696(100)
Gender					
Female	27(4.7)	7(1.2)	10(1.7)	533(92.4)	577(100.0)
Male	21(3.7)	7(1.2)	8(1.4)	527(93.6)	563(100.0)
Total	**48(4.2)**	**14(1.2)**	**18(1.6)**	**1060(93)**	**1140(100.0)**

Table 2 shows that among the 120 study subjects with refractive errors 39(32.5%) of them were having family history of Refractive Errors. The difference between them was found to be statistically significant ($p<0.05$). Out of 120 study subjects with refractive errors, 63(52.5%) of them were in birth order more than I, where as 57(47.5%) of them belonged to birth order one. The odds of subjects having refractive errors belonging to birth order more than I was 1.5times more than subjects belonging to birth order I. Among the subjects with the habit of reading in dim light 52(43.3%) had refractive errors.

Table 3 shows among 444 subjects in 7-10years age group 10 (2.3%) of them had Myopia and hypermetropia. The astigmatism was found among 14 (2%) of study subjects belonging to 11-15years. Among 577 females 27 (4.7%) had Myopia, 7 (1.2%) had Hypermetropia and 10 (1.7%) had Astigmatism. Out of 563 males, 21 (3.7%) had Myopia, 7 (1.2%) had Hypermetropia, and 8 (1.4%) had Astigmatism.

The habit of reading while travelling was present among 116 (10.2%) of the study subjects. 131 (11.5%) of them had eye check up in last one year. Among 44 study subjects using spectacles majority of them 30 (68.2%) were using regularly. Distribution of study participants with closed reading habits was assessed and 583 (82.9%) of them had habit of holding book very close by while reading and 120 (17.1%) had habit of studying while lying down.

DISCUSSION

Out of 1140 study participants of age 7 to 15 yrs mean age was 11.28±2.273 and 42.7% belonged to age group of 10- 12 yrs, (Table1). The mean age was 13.8±1.7 years in a similar study conducted by Jayanth et al[7] in rural area of North Maharashtra. Sethi et al [8] in their study on refractive errors in school children where mean age was 13.22 years

In the present study prevalence of refractive errors was 10.5% similar results were found in Jayanth et al[7] study (10.12%).This results were similar to the studies by Singh et al[9](13.09%), Chandramohan et al[2](9%),Shresta et al[10](8.6%), Pavithra et al[11](7.03%).

Dhulani et al[12] in their study among school children in Jaipur found that prevalence of Refractive Errors was 30.39%.Hussein et al[13] also reported higher prevalence of Refractive Error (25.32%)in school children of Tafila city. This difference may be due to rapid urbanization.

The study shows the Prevalence of Refractive Error was found more (70.8%) in 11-15year age group compare to 7-10 years age group and this is statistically significant (Table 2). Similar results were observed in study by Pavithra et al[11] in Bangalore where Refractive error increased significantly with increased in age .In a study done by Saad et al[14]the prevalence of refractive error was significantly higher among subjects aged >12years.The association of age and the prevalence of Refractive error in study might be explained by other environmental confounders, such as higher school level and greater hours of near-work per day.

Among the study subjects with refractive errors 69(57.5%) of them were females and 51(42.5%) were males (Table 2).The association between the refractive errors and gender was not statistically significant .Similar results were observed in Prema et al[5], Sethi et al[8], Singh et al[9], Hetal et al[15] ,Puri et al[16], Kumar et al[17], where prevalence of refractive errors was more common in females than males and association was not statistically significant. The significant elevation of the prevalence of Refractive error among females was due to the fact that women's eyes have a shorter axial length and shallower anterior chamber depth than those of males, and hence a higher probability of being hyperopic.

Distribution of study participants with refractive errors according to their family history of refractive errors was shown in Table 2**.** Among the participants 32.5% of them with refractive error had family history .In study done by Prema et al[5] 21(45.7%) of the participants had positive family history. Another study by Ali et al[18] reported strong association between Refractive errors and family history. Similar results were observed in the studies done by Saad et al [14], Mohammed et al[19],

Sun et al[20], Hashim et al[21]. The genetic influence may be reason for the association between family history and Refractive errors.

The prevalence of refractive errors was high (52.5%) in study participants belonging to birth order more than I than study participants of first birth order (47.5%) (Table 2).In contrast the study done by Hetal et al[15] in Gujarat observed that the refractive errors were more in children of first birth order (40%) than the second birth order (33.5%). Possible mechanisms underlying the association between birth order and myopia include low birth weight, post-natal catch-up growth and insulin resistance.

A study done by Ali et al[18] in Lahore observed a strong association between studying in dim light and refractive error. In the present study 43.3% of the study participants reading in dim light had refractive errors and the association with dim light and refractive errors was not statistically significant .This could be due to less knowledge among the study participants about ill effects of reading in dim light .As brighter light could reduce the development of myopia through pupil constriction, resulting in less visual blur.

Among the study participants belonging to age group of 11-15 years 38(5.5%) were Myopes. These observations were similar to the one made by Pavithra et al[11] in Bangalore.

In the present study 27(4.7%) of females and 21(3.7%) of males have myopia (Table 3). In a study by Ali et al[18] Myopia and Hypermetropia are more common among females and Astigmatism is more common among males.

The limitation of the study was many of the study participants did not come for referral to Ophthalmology Department in spite of repeated intimation.

CONCLUSION

Refractive error among children is a common problem and the present study indicates that the school age represents high risk group for refractive errors. The study reveals that prevalence of refractive error was high among age group 13 to 15years and there existed significant association between prevalence of refractive errors and age, gender, family history, birth order. This suggests that if either or both the parents having vision problem, they must take their children to the ophthalmologists regularly before occurrence of the vision problem. Parents and teachers should inculcate good reading habits among children to maintain good vision. Screening of the children for vision at the time of school admission and periodical eye examination of the children is recommended for early rectification of impaired vision in school children.

REFERENCES

1. Who.int. WHO | Visual impairment and blindness [Internet]. 2015. Available from: http://www.who.int/mediacentre/factsheets/fs282/en/ Accessed August 22nd 2015]
2. Chandramohan S, Jain R, Samantha S, Jyothi L, Nivedita .J N. A Cross-Sectional Study on Prevalence of Refractive Errors among Primary School Children in Udupi Taluk, Karnataka. IJSR. 2012; 3(4):417-419.
3. World Health Organization. World Health Statistics 2015 [Internet]. Geneva: World Health Organization; 2015; 152-153. Available from: http://apps.who.int/iris/bitstream/10665/170250/1/9789240694439_eng.pdf?ua=1&ua=1
4. Kamath B, Prasad B, Deepthi R, Muninrayana C. Prevalence of ocular morbidity among school going children (6-15years) in rural area of Karnataka, South India. Int J Pharm Biomed Res [Internet]. 2012;3(4):209-212. Available from: http://www.pharmscidirect.com/Docs/IJPBR-2012-04-123.pdf. [Accessed June11th 2015]
5. Prema.N. A study on prevalence of refractive errors in school children. Indian Journal of Science and Technology [Internet].2011; 4(9):1160-1161.Available from: http://www.indjst.org/index.php/indjst/article/view/30248. [Accessed September 20th 2017]
6. Naidoo K, Raghunandan A, Mashige K, Govender P, Holden B, Pokharel G et al. Refractive Error and Visual Impairment in African Children in South Africa. Investigative Ophthalmology & Visual Science. 2003; 44(9):3764.
7. Jayanth D , Malathi K. Prevalence of ocular morbidities among school children in rural area of North Maharashtra in India. National Journal of Community Medicine [Internet]. 2011;2(2):249-254.
8. Sethi S, Kartha G. Prevalence of refractive errors in school children (12-17 years) of Ahmedabad City. Indian Journal of Community Medicine. 2000;25(4):181-3.
9. Singh H, Saini V, Yadav A, Soni B. Refractive errors in school going children – Data from a school screening survey programme. National Journal Of Community Medicine. 2013;4(1):137-140.
10. Shrestha G, Sujakhu D, Joshi P. Refractive error among school children in Jhapa, Nepal. Journal of Optometry. 2011;4(2):49-55.
11. Pavithra M, Maheshwaran R, Rani M. 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. Int J Med Sci Public Health. 2013;2(3):619.
12. Dhulani N, Dhulani H. Prevalence of Refractive Errors among School Children in Jaipur, Rajasthan. Int J Sci Stud [Internet].2014;2(5):52-55. Available from: http://www.ijsssn.com/uploads/2/0/1/5/20153321/ijss_aug_oa12.pdf [Accessed August 10th 2016]
13. Bataineh H, Khatatbeh A. Prevalance of Refractive Errors in School Children of Taif City. RMJ [Internet]. 2008;33(1):86-88. Available from: http://www.scopemed.org/fulltextpdf.php?mno=7549[Accessed April 22nd 2016]
14. Saad A, El-Bayoumy B. environmental risk factors for refractive error among Egyptian school children. Eastern Mediterranean Health Journal. 2007;13(4):819-827.

15. Rathod H, Raghav P, Mittal S. Profile of School Going Children with Visual Impairment. Indian Medical Gazette [Internet]. 2011:435- 437. Available from: http://medind.nic.in/ice/t11/i11/icet11i11p434.pdf [Accessed August 11th 2017]

16. Puri S, Dang R, Akshay. Evaluation of QOS (quality of services) by log frame analysis (LFA) and ocular morbidity in school children of Chandigarh. International Journal of Pharmacy and Pharmaceutical Sciences [Internet]. 2013;6(9):55-58. Available from: http://innovareacademics.in/journals/index.php/ijpps/article/view/8288 [Accessed May 8th 2017]

17. 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 [Internet].2014 Jan31; 2(1): 58-67. Available from http://www.ijrhs.com/issues.php?val=Volume2&iss=Issue1 [Accessed May 8th 2017]

18. Ali A, Ahmad I, Ayub S. Prevalence of undetected refractive errors among school children. biomedica [Internet]. 2007;23:96-101. Available from: http://www.thebiomedicapk.com/articles/118.pdf [Accessed August 16th 2018]

19. Mohammed A, Wasfi E, Kotb S, Khalek E. Refractive Errors among Primary Schools Children in Assiut District, Egypt. Journal of Education and Practice [Internet]. 2014;5(1):101-113. Available from: http://www.iiste.org/Journals/ index.php/JEP/article/view/10418[Accessed July 9th 2018]

20. Sun Y, Cao H, Yan ZG. Prevalence of refractive errors in middle school students in Lanzhou city. Int J Ophthalmology.2008;1(2):180-182

21. Prevalence of refractive error in Malay Primary school children in suburban area of Kota Bharu,Kelantan,Malaysia. Annals of Medicine. 2008;37(11):940-946.