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Original Research Article

A study on prevalence of refractive error and its associated factors among school children in Tamil Nadu

M. Megala[1], S. Dhamodharan[2]*, M. Duraimurugan[1], K. Chellavel Ganapathi[1]

[1]Department of Community Medicine, Govt. Mohan Kumaramangalam Medical College, Salem, Tamil Nadu, India
[2]Department of Community Medicine, Govt. Dharampuri Medical College, Dharampuri, Tamil Nadu, India

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***Correspondence:**
Dr. S. Dhamodharan,
E-mail: drdhamu.ss@gmail.com

ABSTRACT

Background: Refractive error is an avoidable cause of visual impairment. Children do not complain of defective vision. This warrants early detection and treatment. The study was conducted with the objective of estimating the prevalence of refractive error in school children and its associated factors.
Methods: This was a cross sectional study conducted in schools of selected district in Tamil Nadu from July 2017 to January 2018. Sample size of 422 covered. A semi structured questionnaire was used to collect the details and also screened for refractive errors. Data was analysed using SPSS.
Results: Among the 422 students screened, 86 (20.4%) had refractive error. The prevalence of refractive error showed significant association with age, education and occupation of parents, socio economic status, parental history of refractive error, duration of watching television and body mass index.
Conclusions: Refractive errors among school children can be easily identified by regular eye screening programmes, promptly treated can be protected from future complications. Periodic screening of school children is very essential to improve the quality of eye-sight.

Keywords: Refractive error, School children, Tamil Nadu

INTRODUCTION

"Eyes are the most precious of our sense organs. They contribute greatly to one's learning capacities right from childhood. The ultimate moulding of a person's personality and potentiality rests with his nature, surroundings and quality of eye sight." In school children, vision screening should be done very effectively to detect refractive errors, the correctable cause of decreased vision. In developing countries, children in the school-going age group represent 25% of the population. Cataract and refractive error are the two leading causes of vision impairment. Globally, moderate or severe distance vision impairment or blindness due to unaddressed refractive error is 123.7 million.[1] Refractive error is the commonest condition, seeking attention at ophthalmology outpatient department.[2,3] Global data shows uncorrected refractive errors (43%) are the leading cause of visual impairment followed by un-operated cataract (33%) and glaucoma (2%).[4] "Vision 2020: the right to sight" program, a global initiative launched by WHO in the year 1999 to prevent rectifiable blindness from worldwide by the Year 2020. By doing this, WHO prioritised prevention of blindness in children as an important agenda. Developing countries accounts to three-fourth of total 1.4 million blind children across globe.[5] Global estimate states that 153 million people over 5 years of age are visually impaired primarily due to uncorrected refractive errors and 8million amongst are blind. In the age group 5-15 years, 12.8 million are visually impaired from uncorrected or inadequately corrected refractive errors, a global prevalence of 0.96%.[5] The prevalence of blindness in school children is estimated to be 0.8/1000 children in the age group of 0-15 years.[6]

Number of environmental factors associated to socioeconomic status and lifestyles have been reported, and are widely believed to be possibly responsible for these changes. Complicated interaction between genetic predisposition and environmental exposures are also seen as an important evidence for refractive errors. Extended duration of near work activity, inappropriate and delay in refractive correction, incorrect reading posture or habits, inadequate rest to eye functions, lack of outdoor activities, excessive television watching and increased duration of computer activity were the possible determinants of myopia.[7]

Elimination of avoidable blindness and visual impairment due to uncorrected refractive error is a major objective of VISION 2020**.** There are approximately 45.5 million people who are visually impaired globally due to uncorrected refractive error.[8] Hence, this present study was designed and performed to estimate the prevalence of refractive error in school children in selected district in Tamil Nadu.

This study was done to estimate the prevalence of refractive error in school children and its associated risk factors in Tamil Nadu.

METHODS

This study was conducted as a cross sectional study from July 2017 to January 2018 to estimate the prevalence of refractive error and its associated factors among school children in selected schools of Krishnagiri, Tamil Nadu. All boys and girls of 6th to 8th standard in selected schools were included. Absentees on the day of data collection were excluded. The sample size is calculated based on estimated mean prevalence of 10%. Considering confidence interval of 95%, absolute precision of 3% with 10% excess sampling to account for non-response, the sample size derived is 422.

$$N = \frac{1.96^2 \times 10 \times 90}{3^2} = 384$$

Where, Z1-α= standard normal deviant at 95% confidence level i.e. 1.96, p= prevalence= 10%, q= 100-p= 90%, d= absolute precision of 3%, Allowing a 10% non-response rate the sample size comes around 384+38= 422.

First stage was simple random sampling method followed by stratified sampling selection of schools and all the students from sixth to eighth standard in the selected schools were included in the study. A Pretested semi-structured questionnaire was developed and validated. It consists of socio demographic details of the individual and the family, history related to refractive error, parental and sibling history of refractive error, time spent in near work and outdoor activities. Vision screening was done with the help of experienced optometrist under the supervision of investigator.

Data collection was done after obtaining permission from the Institute Ethics Committee. The data was entered in MS excel and analyzed using SPSS version 21. Chi square tests and regression were used and $p<0.05$ was considered to be significant.

RESULTS

In this cross sectional study totally 422 school children in randomly selected schools were included to estimate the prevalence of refractive error in school children and also the associated factors for the disease in the study population.

Among the study participants, 18 (4.3%) were 10 years old, 123 (29.1%) were in the age of 11 years, 139 (32.9%) were in 12 years of age, 119 (28.2%) were 13 years old, 23 (5.5%) were in the age of 14 years. Boys were majority 56.4% (238) and 43.6% (184) were girls. Overall there was equal distribution of participants in both government and private schools, 32.7% of participants were in sixth, 34.6% of participants were in seventh and 32.7% of participants were in eighth class. Also 97.4% were Hindus, 1.7% Muslims and 0.9% Christians. Majority of the participants were from nuclear family (69.2%) and 26.8% belonged to three generation type of family. Socioeconomic classification was done based on Modified BG Prasad scale, it shows that only 6.9% belonged to class I, 17.3% belonged to class II, 24.9% belonged to class III, 36% to class IV and 14.9% to class V. In the current study 5.8% of the participants were overweight (Table 1).

Table 1: Socio demographic details of the study participants.

Socio demographic factors		Frequency (N)	Percentage (%)
Gender	Boys	238	56.4
	Girls	184	43.6
Religion	Hindus	411	97.4
	Christian	04	0.9
	Muslims	07	1.7
Type of family	Nuclear	292	69.2
	Three generation	113	26.8
	Joint family	17	4.0
Socio economic status			
>6003	Class I	29	6.9
3002-6002	Class II	73	17.3
1801-3001	Class III	105	24.9
901-1800	Class IV	152	36.0
<901	Class V	63	14.9

Among the four schools visited (n=422), 86 school children (20.4%) had refractive error and the remaining 336 school children (79.6%) did not have any refraction problems in both the eyes (Figure 1).

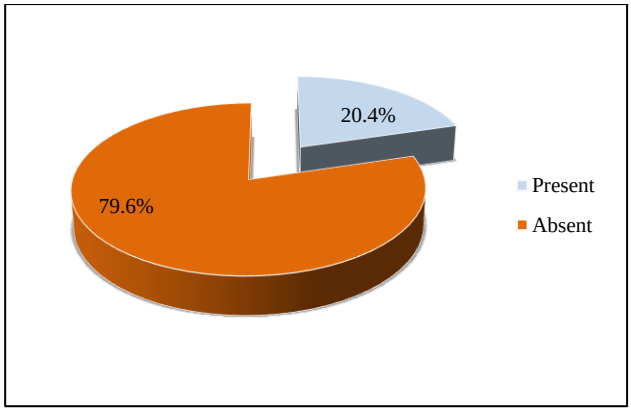

Figure 1: Prevalence of Refractive error among participants (n=422).

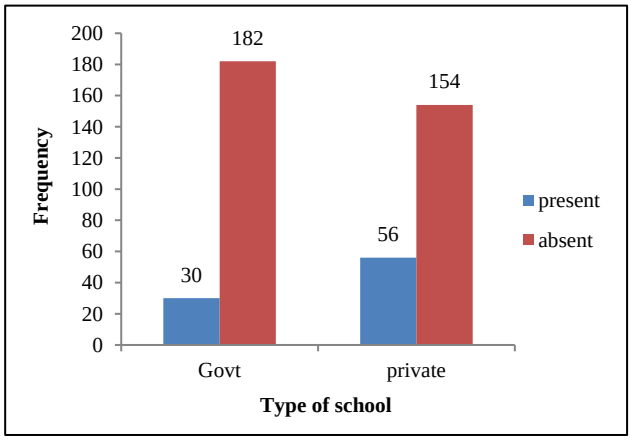

Figure 2: Distribution of refractive error among government and private schools.

Among the study participants, private school students had 26.7% (N=56) prevalence of refractive error when compared to government school students who had only 14.2% (N=30) as in Figure 2. A statistically significant association was found between students in private school and prevalence of refractive error. In the current study, prevalence of refractive error at the age of 11, 12, 13 and 14 years were 17.9%, 17.3%, 20.2% and 34.8% respectively. A statistically significant association was found between increasing age and refractive error. Also 18.1% of male participants and 23.4% of female participants had refractive error. The association between gender and refractive error was not statistically significant. It shows that prevalence of refractive error increases as the socio economic class improves and statistically significant association was found. The most common symptom was blurred vision (26.7%) followed by double vision (15.1%), headache (11.6%), irritation, watering, pain and redness. Among the participants, 14.9% (N=63) had parental history of refractive error and 6.4% (N=27) had sibling history of refractive error in the family. It shows that 10.7% of the study participants were not spending time in playing outdoors. 30.1% of the participants were spending 30 minutes, 48.6% were spending about 1 hour per day in playing outdoors. In the study, 57% of the participants were watching television at a distance of less than 10 feet and 43% were watching at a distance more than 10 feet (Table 2).

Table 2: Factors associated with refractive error.

Factors	Refractive error		P value
	Yes N (%)	No N (%)	
Parental history of RE	36 (57.10)	27 (42.90)	0.009 (s)
Sibling history of RE	8 (29.6)	19 (70.4)	0.241 (ns)
High BMI	8 (32)	17 (68)	0.009 (s)
Time spent in near work	36 (23.2)	119 (76.8)	0.277 (ns)
Time spent in watching TV	20 (25.6)	58 (74.4)	0.011 (s)
Distance of watching TV	52 (22)	184 (78)	0.310 (ns)
Time spent on gadgets	3 (10.7)	25 (89.3)	0.223 (ns)
Reading posture	16 (32.7)	33 (67.3)	0.023 (s)
Playing Outdoors-reduced	71 (20.5)	276 (79.5)	0.348 (ns)

*ns- Not significant; s- Significant.

DISCUSSION

Globally, uncorrected refractive errors (43%) are the main cause of moderate and severe visual impairment. 80% of all visual impairment can be prevented or cured. In the present study, among the four schools visited, 86 school children (20.4%) had refractive error. This is similar to the study done by Joice et al in Puduchery which reported prevalence of 20.9%.[9] The most common refractive error in the study population was myopia 19.7% and only 0.7% of hypermetropia was observed. Mutti et al observed that among the eighth grade children, the prevalence of myopia was 18.3% and hyperopia was 7.7%.[10]

In a survey conducted by Lin et al in Taiwan to study the prevalence and severity of myopia among school children, the rate of myopia increased from 20% at 7 years, to 61% at 12 years, and 81% at 15 years.[11] The most common refractive error in the study population was myopia 19.7% and only 0.7% of hypermetropia was observed. Mutti et al observed that among the eighth grade children, the prevalence of myopia was 18.3% and hyperopia was 7.7%.[10] That increasing age was associated with increased risk of having myopia, this finding is consistent with study by Sun et al.[12]

Saw et al also observed similar positive associations between higher myopia prevalence rates and more advanced father's and mother's education (p=0.001, for each).[13] This could be probably due to increased pressure

by parents to spend more time in academic activities. Kamath et al also observed that refractive error was the commonest problem among the private school going children (6.5%).[14] Children with one and two myopic parents had two times and eight times higher risks, respectively, of developing myopia compared to those with no myopic parents.[15] Mutti et al showed that those children with myopia spent more time engaged in near activities and less time engaged in sports (p=0.0003), compared with emmetropes.[10] Many of the children who work more than two hours with computers and watching TV a lot are affected by refractive error than the children who use the same, for less than two hours.[16] Also a statistically significant inverse association was found between refractive error and outdoor activities with Chi square value of 10.89 and p value=0.001.[16]

CONCLUSION

Many ocular diseases have their origin in childhood and the morbidity may go unnoticed and adversely affect the child's performance in school and may also cause severe ocular disability in the later part of life. The study therefore highlights the high prevalence of undetected refractive error in the school children and the importance of early detection and treatment with corrective spectacles which halts the further progression of refractive error. The awareness among school teachers should also be improved and they should play an active role in identifying the ocular problems and referring them for timely management. Using computers and other near work activities must be shortened. Parents insist that their children should have as many outdoor activities as possible. In the future more accurate and more standardized methodology for quantifying near work needs to be used, which should facilitate precise comparison between different studies. Timely access to quality care has a major influence on the impact of eye conditions.

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REFERENCES

1. Preventing blindness in children: report of a WHO/IAPB scientific meeting, Hyderabad, India, 13-17 April 1999. Available at: WHO_PBL_00.77.pdf. Accessed on 25 June 2017.
2. Murthy GVS, John N, Gupta SK, Vashist P, Rao GV. Status of pediatric eye care in India. Indian J Ophthalmol. 2008;56(6):481-8.
3. Dandona R, Dandona L. Refractive error blindness. Bull World Health Organ. 2001;79(3):237-43.
4. WHO. Blindness and vision impairment. Available at: https://www.who.int/health-topics/blindness-and-vision-loss#tab=tab_1. Accessed on 10 September 2017.
5. Rahi J, Gilbert C, Foster A, Minassian D. Measuring the burden of childhood blindness. Br J Ophthalmol. 1999;83(4):387-8.
6. Jose R, Sachdeva S. School eye screening and the National Program for Control of Blindness. Indian Pediatr. 2009;46(3):205-8.
7. Seet B, Wong TY, Tan D, Saw SM, Balakrishnan V, Lee L, et al. Myopia in Singapore: taking a public health approach. Br J Ophthalmol. 2001;85(5):521-6.
8. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull World Health Organ. 2008;86:63-70.
9. Joice S. Assessment of nutritional status and morbidity pattern among school children of rural Puducherry. Acad Med J India. 2013;1(1).
10. Mutti DO, Mitchell GL, Moeschberger ML, Jones LA, Zadnik K. Parental myopia, near work, school achievement, and children's refractive error. Invest Ophthalmol Vis Sci. 2002;43(12):3633-40.
11. Lin LL, Shih YF, Hsiao CK, Chen CJ, Lee LA, Hung PT. Epidemiologic study of the prevalence and severity of myopia among schoolchildren in Taiwan in 2000. J Formos Med Assoc Taiwan Yi Zhi. 2001;100(10):684-91.
12. Sun Y, Cao H, Yan ZG. Prevalence of refractive errors in middle school students in Lanzhou City. Int J Ophthalmol. 2008;1(2):180-2.
13. Saw SM, Chua WH, Hong CY, Wu HM, Chan WY, Chia KS, et al. Nearwork in early-onset myopia. Invest Ophthalmol Vis Sci. 2002;43(2):332-9.
14. Kamath BP, Prasad GBS, Deepthi R, Muninrayana C. Prevalence of ocular morbidity among school going children (6-15 years) in rural area of Karnataka, South India. Int J Pharm Biomed Res. 2012;3(4):209-12.
15. Ip JM, Huynh SC, Robaei D, Rose KA, Morgan IG, Smith W, et al. Ethnic differences in the impact of parental myopia: findings from a population-based study of 12-year-old Australian children. Invest Ophthalmol Vis Sci. 2007;48(6):2520-8.
16. Prema N. Causing factors of refractive error in children: heredity or environment? Indian J Sci Technol. 2011;4(12):1773-4.

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