OPEN ACCESS
Scholars International Journal of Anatomy and Physiology
Abbreviated Key Title: Sch Int J Anat Physiol
ISSN 2616-8618 (Print) |ISSN 2617-345X (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Study of Refractive Errors among Secondary School Children

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DOI: 10.36348/sijap.2021.v04i11.002 | **Received:** 01.11.2021 | **Accepted:** 05.12.2021 | **Published:** 10.12.2021

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Abstract

Background*:** Vision is the primary means of integration between individual and external environment. Childhood visual impairment due to refractive errors is a significant problem in school children. School children constitute a special group as uncorrected refractive errors cause a vulnerable impact on student routine school work, physical, mental, behavioral development as well as day to day activities. This warrants early detection and treatment to prevent permanent disability. ***Objectives: To study the prevalence of refractive errors in secondary school children and to associate factors affecting reduced vision in school children. ***Method:*** A cross-sectional study was conducted on school children of a Zilla Parishad High School. Visual acuity test was performed using Snellen's E Chart and, subjects with VA≤6/9 were examined for refractive error by an optometrist using a trial lens set. A Pretested questionnaire was administered. Parental consent was obtained and assent was taken before the examination, children whose parents did not give consent were excluded. A total of 314 students participated. Data were entered in Microsoft excel sheet and analyzed using SPSS version 21. Results were expressed as proportions for different study variables. ***Results:*** Out of 314 students, the majority 161(51.27%) of study participants were girls. The highest number of students (68%) was between 14-15yrs. Among 314 students examined, 40 (12.74%) students were suffering from refractive errors, myopia being the commonest (10.2%), Astigmatism-affected in 8 (2.54%) children. Most of the students (60.5%) were in the lower middle socio-economic class. The percentage of the population with 2-4hrs/day screen exposure duration is 42.35%. But there is no statistical significance of reduced vision was observed with taken study variables, considering a p-value<0.05 was taken as a significant association. ***Conclusions:*** The prevalence of refractive errors was 12.74% in this study. Children should be educated regarding ocular hygiene, early correction of refractive errors, limited screen time. Recommended planning appropriate eye care programmes to reduce the burden of visual impairment among the younger population.

Keywords: School children, visual acuity, refractive errors.

INTRODUCTION

Vision is the primary means of integration between individual and external environment. Childhood blindness is one of the priority targets of Vision 2020-Right to Sight due to its impact on the psychological and social growth of the child. Global estimates on childhood blindness show that around 1.42 million and 17.52 million children suffer from moderate to severe visual impairment respectively [1]. Childhood visual impairment due to refractive errors is a significant problem in school children and has a considerable impact on public health. Refractive error is an optical defect of the eye that prevents light from being brought to a sharp focus on the retina. Uncorrected refractive error causing impairment of vision is 153 million people worldwide as estimated by WHO [2]. And Vision Loss Expert Group (VLEG) estimates that uncorrected refractive error is the leading cause of visual impairment,48.9% globally and 62.9% in South Asia [3]. Quite recently, the WHO has fixed the target to reduce the burden of avoidable visual impairment by 25% by the year 2019 from the baseline established by WHO in 2010. Particularly the school children constitute a special group as uncorrected refractive errors cause a vulnerable impact on student routine school work, physical, mental, behavioral development as well as day to day activities [4]. Children may adjust to poor vision by strategies such as changing positions in the classroom, moving objects closer, and tending to avoid tasks that require more

visual concentration. This warrants early detection and treatment to prevent permanent disability [5]. According to the National Eye Institute, half of all cases of blindness might be preventable, with timely and adequate treatment [10]. Low socioeconomic status also perpetuates ill health, including eye health [6-9].

OBJECTIVES

- To study the prevalence of refractive errors in secondary school children and
- To associate factors affecting reduced vision in school children.

METHODS

A cross-sectional study was conducted on school children of Zilla Parishad High School, Thotagaruvu, Visakhapatnam. The present study was undertaken among school children from the 6^{th} to 10^{th} class. School children of both genders from the 6^{th} to 10^{th} class were included in the study by using a convenient sampling technique. Visual acuity of each eye was measured with help of Snellen's E chart, and those subjects with VA≤6/9 were examined for refractive error by an optometrist using a trial lens set. Children, requiring further diagnostic assessment or treatment, were referred to Ophthalmic OPD. A total of 314 students were included in the study. Data was collected using pretested questionnaire method. It was filled and completed by the students' parents or legal guardians regarding their respective consents and sociodemographic information. Before taking the eye medical screening, the questionnaires were collected. Socio-economic status measured based on Modified Kuppu Swamy's scale.

Before taking the eye medical screening, written consent was obtained from guardians of all students who participated in the study and assent from participants taken as well. children whose parents did not give consent were excluded. Informed consent was taken from School Principal. Institutional Ethical clearance was obtained before data collection. Data were entered in Microsoft excel sheet and analyzed using Statistical Package for Social Sciences (SPSS) version 21. Results were expressed as proportions for different study variables. a p-value<0.05 was taken as a significant association.

RESULTS

A total of 314 school children from the 6^{th} to 10^{th} class participated in the study. The majority of the study subjects were Girls (51.27%) followed by Boys (48.73%). Among Girls and boys, the majority of the students belong to the age group of 14 to 15 years. The Mean age of the study population was 14.498 ± 0.96 years. Most of the study population was between 14-15yrs of age (68%).

Table 1: Distribution of study subjects according to their age and gender

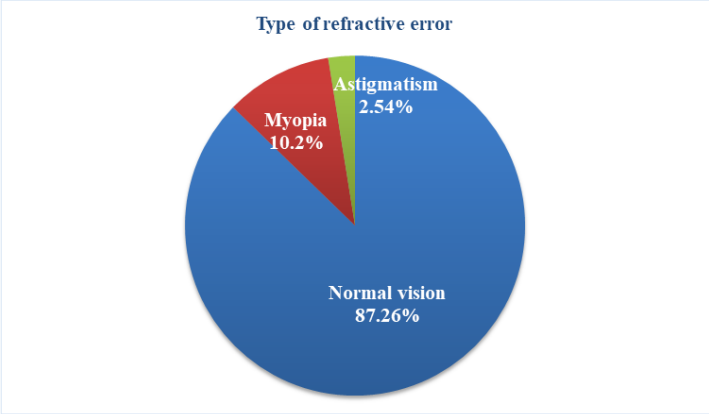
Age group (in years)	Boys	Girls	Total
12-13	23	24	47 (15%)
14-15	100	114	214 (68%)
16	30	23	53 (17%)
total	153 (48.73%)	161 (51.27%)	314 (100)

Out of a total 314 students examined, 40 were suffering from refractive errors. Among them, 18 were boys and 22 were girls.

Table 2: Distribution of study subjects based on the percentage of school children with refractive errors

	Frequency	Percentage
Normal vision	274	87.26 %
Reduced vision with refractive errors	40	12.74%
Total	314	100 %

Among the various types of refractive errors myopia was most prevalent, affecting 10.2%i.e 32 children. Myopia is a refractive error, also known as nearsightedness, where visual acuity is good at near and poor at distance. According to sex, 12 boys (7.84% of boys) and 20 girls (12.42% of girls) were suffering from myopia. Astigmatism is an irregularity on the surface of the cornea (optical lens defect). Astigmatism was found in 8 children (2.54%), affecting 6 boys (3.92% of boys) and 2 girls (1.24% of girls) respectively.



87.26% of students had visual acuity 6/6 and 12.74% had visual acuity <6/9

Table 3: Distribution of study subjects according to visual acuity in both eyes

Visual acuity				
	Right Eye		Left Eye	
	Frequency	Percentage	Frequency	Percentage
6/6	275	87.57	277	88.21
6/9	8	2.55	7	2.23
6/12	8	2.55	8	2.55
6/18	7	2.23	12	3.82
6/24	7	2.23	4	1.27
6/36	1	0.32	1	0.32
6/60	8	2.55	5	1.6

In the age group of 12-13yrs,22.5% had refractive errors whereas 65% of children in the age group of 14-15yrs had refractive errors. The majority of students were from the lower middle socio-economic class (60.5%) and among them, more number of students had visual acuity ≤6/9. 25.47% of the population were from the Upper middle and 14% from upper-lower socio-economic class. In the present study, out of 153 males, 18 (11.77%) school children were with refractive errors and, out of 161 females, 22 (13.66%) had refractive errors In the present study association between socio-demographic variables and reduced vision with refractive errors was found to be not statistically significant.

Table 4: Association between reduced vision due to refractive errors and study variables

	Reduced vision with refractive error	Normal vision	P-value
Socio economic status			
Upper Middle	7 (17.5%)	73 (26.65%)	0.386
Lower middle	28 (70%)	162 (59.12%)	
Upper lower	5 (12.5%)	39 (14.23%)	
Gender			
Boy	18 (45%)	135 (49.27%)	0.613
Girl	22 (55%)	139 (50.73%)	
Age			
12-13yrs	9 (22.5%)	38(13.87%)	0.312
14-15yrs	26 (65%)	188(68.61%)	
16yrs	5 (12.5%)	48(17.52%)	
Computer usage; Television/Mobile exposure duration			
<2 hrs/day	9 (22.5%)	68 (24.82%)	0.78
2-4 hrs/day	19 (47.5%)	114 (41.61%)	
>4 hrs/day	12 (30%)	92 (33.57%)	

Uncorrected refractive errors were found in 40 (12.7%) students. The reasons are mainly unhygienic living conditions, malnourishment, and the alluring media influence like television, computer games, and diminishing parental care, etc.

A total of 314 students participated, majority (35.03%) students consuming green leafy vegetables 1-2 times weekly, 33.1% consuming 5-7 times weekly, 26.5% consuming 3-4 times weekly. However, no statistically significant relationship was observed between uncorrected refractive error and intake of green leafy vegetables.

Table 5: Association between reduced vision due to refractive errors and intake of green leafy vegetables

Intake of green leafy vegetables	Visual acuity 6/6	Visual acuity ≤6/9	Significance
5-7 times weekly	101 (32.16%)	3 (0.95%)	$\chi 2=34.55$, df=3, p=1.51
3-4 times weekly	72 (23%)	11 (3.5%)	
1-2 times weekly	93 (29.62%)	17 (5.41%)	
Nil	8 (2.92%)	9 (22.5%)	

In the present study, 88.53% of students don't have any family history, 11.46% of students had a family history. In the present study, out of 40 school children with defective vision, family history is present in 28 (8.92%) children. out of 274 school children without defective vision, family history is present in only 8 (2.54%) and the association between them was found to be not statistically significant.

Table 6: Association between reduced vision with refractive error and family history

Family history	Normal vision	Reduced vision with refractive errors	Total
Present	8 (2.54%)	28 (8.92%)	36 (11.46%)
Absent	266 (84.71%)	12 (3.82%)	278 (88.53%)
total	274	40	314

Chi-square value=154.73, p=1.606, not statistically significant.

DISCUSSION

The study assessed the prevalence and factors associated with visual impairment due to refractive errors among secondary school children. In the present study out of total 314 students examined, 40 (12.74%) were suffering from refractive errors. The prevalence of refractive errors in various studies varies considerably. Kumar CD and Anga VS reported 34% of children suffering from defective vision [11]. Zhao *et al*., [12] reported the prevalence of refractive errors 18.03% in their study. Maul *et al*., [13] found a prevalence of 13.64%.

In the present study, 10.2% of children had myopia. On the other hand, according to a study done in Brazil, the prevalence of myopia was 5.46% [14]. And a study conducted in New Delhi, India the prevalence of myopia was 16.75% [15].

In the present study, the majority of the study subjects were girls (51.27%) followed by boys (48.73%). Among girls and boys, the majority of the students belong to the age group of 14 to 15 years. In a study conducted by Singh *et al*., [16], a majority of the study subjects were females (53%) than males (47%). In a study conducted by Shrestha et al, 52.8% were males and 47.2% were females [17].

In the present study, out of total 314 students, the majority (35.03%) consume green leafy vegetables 1-2 times a week. Different studies showed a significant association between visual acuity impairment in children with income, educational background, and the visual status of parents. A study done in South Africa [18] showed that poor protein, fruit, and vegetable intake led to poor visual acuity in the subjects. In our study, the majority of children (70%) were from the lower middle socio-economic class. This shows that those children might not get a balanced diet and this may contribute to poor vision.

Causes of low vision like refractive errors can be inherited. A study done by Mutti *et al*., stated that the risk of inheriting impaired visual acuity was increased if parents had similar problems [19]. In this study 11.46% of students had a family history.

This study revealed that those students who watch television/mobile/computer for 2–4 hours/day were two times more likely to develop refractive errors than students exposed screen duration on average for <2 hours/day and similarly students who had screen exposure for >4 hours/day were more likely to develop visual impairment as compared to students who had exposure for <2 hours/day. This might be related to the fact that watching TV/mobile/computer close-ups creates a visual strain on the eye of the children. This can surely cause eyesore and fatigue, particularly for those sitting very close and watching from odd angles.

From the above discussion, it is apparent that visual impairment due to refractive errors in school children is a significant problem. The effect of this can be reflected on the school performances of the

individual child and also on their personal and behavioral development. The problem is large enough to be of public health importance. but it can be solved easily with simple correction of refractive errors.

CONCLUSION

The study has shown a 12.74% prevalence of refractive errors. More efforts are needed to create awareness among students, parents, teachers regarding ocular hygiene, early correction of refractive errors, limited screen time. Routine visual screening should be done in schools for early detection and treatment. Recommended planning appropriate eye care programmes to reduce the burden of visual impairment among the younger population.

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