

Prevalence of refractive errors; an evidence from the public high schools of Lahore, Pakistan

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Abstract

Objective: To assess the magnitude of refractive errors among high school children.

Methods: The cross-sectional, descriptive study was conducted from April to August 2017 in four public-sector high schools in Lahore, Pakistan. Using multistage simple random sampling, all public-sector high schools of the city were initially included. Screening of refractive errors was managed on the school premises. Data was collected on a pre-tested, structured questionnaire. SPSS 23 was used for data analysis.

Results: There were 1000 subjects with an overall mean age of 13.78 ± 1.72 years (range: 10-18 years). Refractive errors were present in 244 (24.4%) and myopia 127 (52%) was the major type of refractive error followed by astigmatism 93 (38.1%) and hypermetropia 24 (9.8%). Difference in the prevalence of refractive errors in urban and rural settings was significant ($p=0.00002$).

Conclusion: Uncorrected refractive errors were present in a considerable segment of public-sector high school students of Lahore.

Keywords: Refractive errors, Public high schools, School children, Visual impairment. (JPMA 69: 464; 2019)

Introduction

There are 259 million visually impaired people in the world, including 98 million having refractive errors.¹ It has been shown that the most common reason for the visit to an ophthalmologist or eye care professional is for refractive errors.² It has been concluded that the main reasons for the impairment of vision are refractive errors (43%) followed by cataract (33%).³ Refractive error-related visual impairment is the most common problem in children.⁴ It is worth mentioning that prevention or treatment of around 80% causes of visual impairment is possible.⁵ The age of a child is related with maximum potential used for the future physical and intellectual growth. The presence of these refractive errors can have many problems with children including educational loss, economic issues, low productivity and impaired quality of life.⁶

Refractive errors can be defined as a condition in which the visual system of the eye is unable to bring the parallel rays of light for focus on retina.⁷ There are three different

types of refractive errors. One is called myopia in which the light rays focus in front of retina, second is hypermetropia in which the rays of light focus behind the retina, and the third is astigmatism in which the light rays cannot be focussed on a single point, resulting in blurred vision. Population-based studies of uncorrected refractive errors in different countries concluded a prevalence of 22.3% in China, 17.3% in Singapore, 17.1% in Malaysia, 15.8% in Chile, 10.2% in Australia, 10.2% in Bangladesh and 6% in the United States respectively.⁸ A study conducted in Bangalore, India, concluded a prevalence of 10% whereas the prevalence found in different relevant studies from Pakistan is 19.8% in Lahore, 20.43% in Kohat, 17.24% in southern Punjab and 21.7% in Lahore^{7, 9-11}. Similarly, the prevalence of refractive errors has been estimated in another study to be around 20% in school-aged children of Pakistan.¹² Another research about the refractive errors among students of a seminary at Harripur concluded a prevalence of 41%.¹³ However, a school-based study among students aged 5-16 years from Rawalpindi reported prevalence of 3.35%.¹⁴ A significant impact of the visual acuity (VA) on the academic performance of school students has been concluded in a Nigerian study.¹⁵

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There is a higher risk of uncorrected errors of refraction in the school-going children which may result in the problems of learning abilities along with the issues in physical and mental development.^{16,17} These children may develop social or emotional issues and can affect their own learning as well as the learning of the peers.¹⁸ These problems can be addressed and the loss of educational performance can be prevented with the provision of eye glasses, medication or other relevant vision therapy.¹⁹

Millions of children in the developing countries are in need of eye glasses due to the presence of refractive error. The barriers for the provision of the required glasses to manage the refractive errors include financial causes and lack of education, lack of services or access and approach to eye care services. As much as 80 per cent of childhood learning difficulties are attributed to vision problems.²⁰ Low vision places the child and his or her family at the risk of poverty and poor health. This ultimately leads to serious issues related with national and international development. Low vision will definitely jeopardise the achievement of two vital global indicators of development in the form of education and health. It is an important public health concern to address the problem of refractive errors in schools. Apart from poverty, studies have also pointed out that economically sound communities can also have undetected or uncorrected refractive errors in children.²¹ This may be due to lack of knowledge and awareness regarding potential impacts of the uncorrected refractive errors.

Subjects and Methods

The cross-sectional, descriptive study was conducted in four public-sector high schools of Lahore, Pakistan, from April to August 2017. Using multistage simple random sampling technique, all the boys and girls in rural and urban areas were initially included. Students in grade 6-10 were included while the rest were excluded. Out of the five Tehsils of the city, 1 was randomly selected. A list of the number of union councils (UNs) was obtained from the relevant office and 1UC each from urban and rural setting was randomly selected. Subsequently, a list of public-sector high schools in both the UCs was obtained from the relevant authorities. One boy's and one girl's high school was randomly chosen from the list of each UC, and in each school 50 students were randomly recruited from each grade.

The sample size was calculated by the OpenEpi tool kit and the relevant formula was used;²²

α	Level of significance	95.00%
P1	Expected Proportion of children with refractive error	20.00% ¹²
d	expected error	6.00%

$$n = \frac{Z_{1-\frac{\alpha}{2}} P (1-P)}{d^2}$$

n Sample size in one group 171

The estimated sample size for each group was 171 subjects. However, to increase the strength, accuracy and precision, 250 subjects were included in each group. Screening of refractive errors, according to the defined protocols,²³ was managed on the school premises. The required instruments including Snellen charts, refraction boxes with trial frames, auto-refractometre, retinoscope, ophthalmoscope, hand-held slit lamp and other logistics were used. Screening was done by a team of optometrists supervised by an ophthalmologist. Informed consent was obtained from the subjects and permission was taken from the respective school managements. The consent of parents was also ensured through the school administrations. Visual Acuity of the study subjects was assessed with a help of a Standard Snellen Chart placed at a distance of six meters. Students with VA less than 6/9 in the better eye or both eyes were tested for the presence of refractive error by a pinhole. The improvement of the vision with pinhole examination was followed by auto and subjective refraction. It was also cross-checked by retinoscopy. Data was collected on a self-generated structured questionnaire. It consisted of different parts, including basic profile of the participants, relevant family history, ophthalmic examination, VA, best correction, diagnosis and type of refraction. The sections related to basic profile and family history were filled by trained research assistants whereas VA and refraction data was completed by the optometrists. However, the parts related to diagnosis and type of error were filled up by an ophthalmologist. The questionnaire was discussed with experts in ophthalmology to ensure its face and content validity. Later, the questionnaire was pretested for reliability. Necessary changes were made before the collection of data which was later analysed using SPSS 23. Ethical approval of the study was obtained from the institutional review board of The University of Lahore.

Results

There were 1000 subjects with an overall mean age of 13.78 ± 1.72 years (range: 10-18 years). Overall, 200(20%) subjects were from each of grade. Refractive errors were present in 244(24.4%) subjects. Myopia 127(52%) was the major type of refractive errors, followed by astigmatism 93(38.1%) and hypermetropia 24(9.8%) (Table 1). History of students regarding use of spectacles was positive in 127(12.7%) subjects, and there was a significant difference across the urban-rural divide in this regard ($p=0.00001$).

Gender-wise prevalence suggested no significant difference in boys and girls (Table 2). However, the difference was significant between rural and urban settings ($p=0.00002$).

Table-1: Frequency distribution of prevalence and types of refractive errors.

	Refractive Errors	Frequency	Percent
Prevalence of Refractive Errors	Yes	244	24.4
	No	756	75.6
	Total	1000	100.0
Types of Refractive Errors	Myopia	127	52.0
	Hypermetropia	24	9.8
	Astigmatism	93	38.1
	Total	244	100.0

Table-2: Gender-based prevalence of refractive errors.

	Yes (%)	No (%)	Total
Boys	111 (22.2%)	389 (77.8%)	500
Girls	133 (26.6%)	367 (73.4%)	500
Total	244	756	1000

The p -value is 0.1. The result is not significant at $p < 0.05$

Table-3: Distribution of refractive errors in rural and urban areas.

	Rural	Urban	Total
Yes (%)	93 (18.6)	151 (30.2)	244
No (%)	407 (81.4)	349 (69.8)	756
Total	500	500	1000

Calculated p -value is 0.00002 and it is significant at p value < 0.05 .

Discussion

Refractive errors in school-children are major public health issues having many immediate and long-term consequences. Results of the present study suggest that every fourth school-going children is having errors of refraction. The finding is contrary to the results of a similar research conducted in two schools of Lahore among the

students of grade 6-10 which concluded that 19.8% of the subjects had refractive errors.⁷ Prevalence of refractive errors (24.4%) found in the present study is also contradictory to the findings of another study in which the school-children had 20.07% refractive errors.¹² These results are quite different from the findings of another relevant study in north-west Ethiopia concluding refractive errors in 9.4% of the study subjects.¹⁶ A study in Saudi Arabia²⁴ reported prevalence rate of 13.7% which is also in contrast to the findings of this study. The types of refractive errors found in this study are similar to other studies concluding myopia as the major error of refraction (61.7%), (43%) and (65.7%) respectively.^{7,12,23} The present augmented magnitude of refractive errors may be due to multiple reasons, including the increased use of information technology (IT) related gadgets in teaching and learning along with the over involvement of students in video games etc. However, these factors need further in-depth exploration to see if it as a major aetiological reason for refractive errors.

Gender-based comparison of refractive errors in the studied population was not significant. However, a study reported that the refractive errors were high among female study subjects, but a study from Eritrea concluded that magnitude of refractive errors was significantly high among the male participants.²³ Besides, the prevalence was found to be significantly high in urban areas compared to rural areas. These results are contrary to the findings of a study which concluded that refractive errors were significantly more among the students of rural residence.²³

The current study was conducted in public-sector high schools of Lahore, which is the provincial capital of Punjab and is considered the educational hub having comparatively better assessable and affordable eye-care services. The results demand an immediate execution of basic policies regarding screening of school-children for refractive errors. The screening activities must be accompanied by awareness campaigns to ensure compliance. Moreover, the screening programme must not be limited to the diagnosis of refractive errors only, rather a comprehensive plan for the provision of required spectacles should be ensured. Relevant eye-care training of teachers should also be tailored within the teachers training programme. Government agencies, philanthropists and other stakeholders must come forward and work for the improvement of child learning by the correction of refractive errors.

Conclusion

Uncorrected refractive errors were present in a considerable number of public-sector high school students of Lahore. There was no significant difference in gender terms, but the problem was significantly high in urban setting compared to rural areas.

Disclaimer: The study is part of a PhD thesis.

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