

Refractive Errors in Children of 11 to 16 Years of Age Group attending Eye OPD at Hayatabad Medical Complex Peshawar

NAVEED AHMAD MOHMAMAND¹, ROZINA SHAHADAT KHAN², ABID ULLAH³, ABID ALAM⁴

¹Mardan Institute of Sciences, ²Health Department Punjab, ³RMI Peshawar, ⁴CMH Bhawalpur
Correspondence to Dr.Rozina Shahadat Khan, Email:dr.rozinakhan@live.com

ABSTRACT

Background: Children of school age are susceptible to refractive error, which has a significant negative influence on lowering the learning capacity and educational potential.

Aim: To estimate the frequency of different types of refractive errors in children, age group 11 to 16 year, visiting eye OPD H.M.C Peshawar.

Study Design: Cross sectional descriptive study.

Place and duration of study: Study has been conducted at Eye OPD of H.M.C Peshawar in three months duration.

Methods: A total of 308 patients fulfilling the inclusion criterion were examined for Visual acuity. Distance visual acuity was measured both monocularly and binocularly by using a Snellen E chart at a distance of 6 meter. After refraction, best corrected visual acuity was assessed and recorded. Refractive status was recorded according to the criterion.

Results: A total of 308 subjects were examined, out of which 73 (23%) were having Ammetropia i.e. having refractive error. Among 73 refractive error children 27 (36.98 %) were having Myopia and 24 (32.87%) were having Hyperopia and 22 (30.13%) were Astigmatic. It was found that male were more affected than females, having frequency of 63% and 36.98% respectively.

Conclusion: Refractive error can no longer be ignored as a target for urgent action. The world must make every effort to meet the goals of VISION 2020. A child's whole life may get ruined just because of uncorrected or inappropriately corrected Refractive error. There is dire need of public awareness regarding refractive errors and availability of services. The results show a great burden of refractive error patients on the hospital, so the facilities of the refractive services need to be increased.

Keywords: Refractive error, visual acuity, Ammetropia, Hyperopia, Myopia

INTRODUCTION

When the eye is unable to properly focus the pictures from the surrounding environment, this is known as refractive error. Refractive errors cause hazy vision, which can occasionally be so extreme that it impairs eyesight. Light is concentrated in front of the retina when someone has myopia. The light is concentrated behind the retina in hyperopia. The unequal focusing of light rays in various meridians results in astigmatism¹.

A healthy eye called an emmetropic eye is one in which all of the incoming light beams from a fixated afar thing are projected clearly on the retina without the need for any accommodative effort. Ammetropia is a situation where parallel light rays are concentrated either In Ammetropia the parallel rays of light are not focused on a single point on the retina and focused either in front or behind the retina (with accommodation at rest)².

Astigmatism, myopia, and hyperopia are the three primary types of refractive defects. Myopia, often known as nearsightedness, is a visual disorder in which close items may be seen well, while those farther away look blurry. If the eyeball is excessively long or the cornea—the transparent front surface of eye has too much curvature, nearsightedness will result. As a result, light reaching the eye is not properly focused, and distant objects seem blurry³.

Myopia (short-sightedness) is quite common globally⁴ in East Asia and Southeast Asia, with myopia incidence in young people ranging from 80-90% and a significant prevalence of severe myopia in young adults (10-20%)⁵. Myopia is the most common cause of avoidable blindness in children and young adults. Myopia has increased dramatically throughout East Asia during the last few years, affecting more than 80% of the younger population⁶. Hyperopia, hyperopia⁷ or farsightedness, is a common vision problem that affects approximately one-fourth of the population⁸. Hypermetropia, or hyperopia, occurs when parallel light rays from infinity converge beyond the retina after refracting on the cornea and lens⁹.

The component of the refractive defect known as manifest hyperopia (facultative hyperopia) can be addressed either by convex lenses or by the patient's own accommodation. The

amount of refractive error that is not offset by accommodation is known as absolute hyperopia¹⁰. Amblyopia is a fairly prevalent condition in childhood and is the main cause of visual impairment in both children and adults¹¹. Astigmatism" occurs when the parallel light rays that pass into the eye through the refractive medium do not fix on an only one spot on the retina to produce the clear view of the item. It might be brought on by corneal or non-corneal causes or both (total astigmatism). Astigmatism is broken down into three types depending on the focal point with respect to the retina: simple astigmatism, compound astigmatism and mixed astigmatism¹².

Astigmatism is categorized as regular and irregular based on the connection between the two principal meridians¹³. As per Friendly, "Amblyopia is a decrease in the quality of central, corrected vision arising from the disruption in retinal image acquisition throughout the first decade of human life"¹⁴. Uncorrected refractive errors harm folks of all age ranges and ethnic groups, are the major cause of vision impairment and have consequences such as lost opportunities for education and employment, decreased productivity, and a decreased quality of life¹⁵. The most frequent optical condition affecting people of all ages is refractive errors. According to WHO 43% of vision problems are attributable to refractive errors¹⁶ and about half of visually impaired folks have uncorrected refractive errors (URE)¹⁷.

Uncorrected refractive errors are the second leading cause of blindness worldwide¹⁸. WHO recently reported that refractive errors are the fourth most prevalent reason of vision loss, with a rate of <3/60. "Vision 2020" has childhood blindness prevention as a top objective¹⁹. Children coming to Dow University of Health Science's OPD were found to have an Amblyopia prevalence of 6.7% which is greater than any other Amblyopia prevalence found in published research²⁰. Research has revealed that myopia and hyperopia are the second and third most frequent refractive defects in both children and adults, respectively. In adults from South-East Asia, myopia and astigmatism were most common. The Americas has the greatest rate of hyperopia in both children and adults¹⁶. A survey from Ireland found that the pervasiveness of myopia (spherical equivalent refraction (SER): 0.50 D), hyperopia (SER: +2.00 D), and astigmatism (1.00 DC) was 3.3%, 25% and 19.2%, respectively, among people involved aged 6-7 years old and 19.9%, 8.9% and 15.9%, respectively, among attendees aged

Received on 14-05-2022

Accepted on 23-09-2022

12–13 years old²¹. A survey from 2019 found that the occurrence of RE was 45.8%. Myopia, which occurred in 24.4% of patients, was the most prevalent kind of RE followed by hyperopia (11.9%) and astigmatism (9.5%). The frequency of the various RE patterns was substantially influenced by age and gender (0.033 and 0.012, respectively)¹⁵. Refractive error was the most prevalent eye condition across students, accounting for 198/254 (78%), based on a research done in India²². In 137 Karachi schools, 35/220 (15.9%) students were found to have impaired vision, of which 25 (9.5%) had refractive error²³. A survey of grade 7 students revealed that myopia incidence was 29.4% and extreme myopia occurrence was 0.4%²⁴. In Pakistan 1.12 million were predicted to be blind (visual acuity [VA] 3/60), 1.09 million [0.93-1.24] to have severe vision loss (3/60VA6/60) and 6.79 million [6.00-7.74] to have moderate vision loss (6/60VA6/18) in 2017²⁵.

Another study conducted among 1000 participants of Lahore's public high school with age between 10-18 years Refractive defects were found in 244(24.4%) of the population. Myopia 127(52%) was the most common kind of refractive error, followed by astigmatism 93(38.1%) and hypermetropia 24(9.8%)²⁶. Children of school age are susceptible to refractive error, which has a significant negative influence on lowering the learning capacity and educational potential.

Therefore, the purpose of this research is to determine the prevalence of refractive errors in children between the ages of 11 and 16 who get eye care at HMC Peshawar.

MATERIAL AND METHODS

After Ethical Committee permission this descriptive cross-sectional study was conducted in eye OPD at Hayatabad Medical Complex, Peshawar amongst 11 to 16 years age group population. 308 subjects were included through consecutive sampling with 95% confidence interval, 5% margin of error and a population of 915 considering 4% non response rate. Subjects with Disabilities (mental, physical, speech and hearing) severe illness and communication problems were excluded. Trained staff performed and recorded Visual Acuity and Retinoscopy of individuals of the selected age group. Distance visual acuity was measured both monocularly and binocularly by using a Snellen E chart at a distance of 6 meter. After refraction, best corrected visual acuity was then assessed and recorded. Refractive status was recorded according to the criterion. Myopia, high Myopia, hyperopia and high hyperopia were defined as a spherical equivalent of ≤ -0.5 diopter (D), < -5.0 D, $> +0.5$ D, and $\geq +3.0$ D respectively. Astigmatism and high astigmatism were defined as cylinder of > 0.5 D and > 2.25 D, respectively (27). $> +0.50D =$ Hyperopia, > -0.50 D = Myopia. Retinoscopy with fogging was used for objective refraction and then its verification was made through subjective Refraction. Cycloplegic refraction was carried out for subjects with hyper active accommodation, i.e. when dry Retinoscopy gives fluctuating results. Data entry and analysis was done using SPSS version 23.

RESULTS

A total of 308 subjects were examined, out of which 73 (23%) were having Ammetropia i.e. having refractive error. Among 73 refractive error children, 27(36.98%) were Myopics 24(32.87%) had Hyperopia and 22(30.13%) were Astigmatic Table 01. Male were more affected than females, having frequency of 63% and 36.98% respectively. The percentage of refractive error of 16 year is high that is (20.54%) followed by 11 years (19.17%) and least among 13 and 14 years having the same percentage (13.69%) (Table 2). In this study it was found that Amblyopia 8/73(10.95%) was the leading condition associated with refractive errors, followed by strabismus 5/73(6.84%) (Fig. 2). Amongst 4 groups (A, B, C & D) group. A=22 children (30%) were enjoying 6/5 vision after correction, group B=28(38%) were having 6/6 best corrected vision, C =14(19%) had 6/9 corrected vision and D=9(12%) had visual acuity of 6/12 after best correction (Table 3).

Fig. 1: Frequency of refractive error gender wise

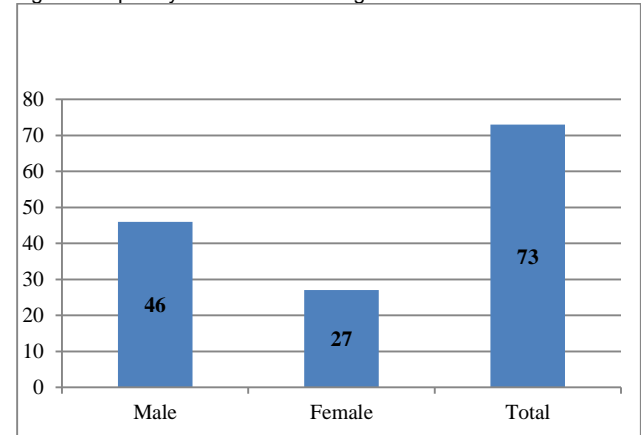


Table 1: Frequency of Refractive Errors

Refractive status	Frequency	Percentage
Ammetrope	73	23.70 %
Emmetrope	235	76.29 %
Total	308	100%
Frequency of Different Types of Refractive Errors		
Myopia	27	36.98 %
Hypermetropia	24	32.87 %
Astigmatism	22	30.13 %
Total	73	100%

Table 2: Frequency Of Refractive Error Age Wise

Age group	Frequency	Percentage
11	14	19.17%
12	11	15.06%
13	10	13.69%
14	10	13.69%
15	13	17.80%
16	15	20.54%
Total	73	100%

Fig. 2: Associated conditions with refractive error

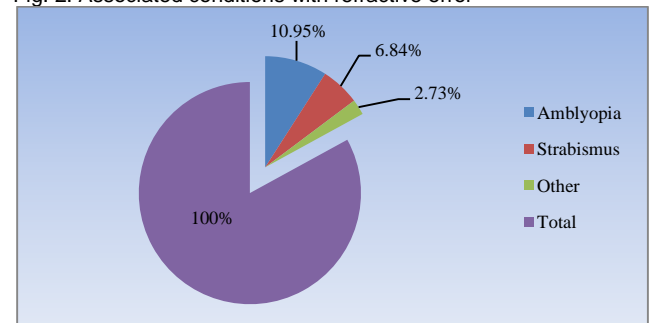


Table 3: Level of best corrected visual acuity in refractive error children

Best Corrected V.A	Frequency	Percentage
A (6/5)	22	30%
B (6/6)	28	38%
C (6/9)	14	19%
D (6/12)	09	12%

DISCUSSION

Childhood blindness and uncorrected refractive errors were among the five priorities targeted in VISION-2020. Visual experience of a child plays a major role in his/her psychological, physical and intellectual development. Visual impairment due to uncorrected refractive error can have both short and long term consequences in children, such as loss of educational and employment opportunities, loss of economic gain for individuals, families and

societies, and impaired quality of life. A child's eyes are constantly in use in the class room and at play. Out of 308 patients of 11 to 16 years, visiting eye O.P.D H.M.C Peshawar, 73(23.70%) were found to have refractive error with Male to female ratio of 63%:37% in 9.5% refractive error reported by a study conducted in Karachi schools²³. Myopia Hypermetropia and astigmatism remained 36.98%, 32.87% and 30.13% respectively in comparison to a survey from Ireland reporting myopia, hyperopia and astigmatism 3.3%, 25%, and 19.2%, respectively among 6-7 years age group and 19.9%, 8.9%, and 15.9%, respectively among 12–13 years old²¹. A sizeable portion of Lahore's public high school pupils with age between 10-18 years had uncorrected refractive problems in 244(24.4%) of the population. Myopia 127(52%) was the most common kind of refractive error, preceded by astigmatism 93(38.1%) and hypermetropia 24(9.8%).

Refractive defects were found (26) . The current study has also shown that the frequency of myopic children was higher than other two types. Children coming to Dow University of Health Science's OPD were found to have amblyopia prevalence of 6.7%, which is greater than any other amblyopia prevalence found in published research while our study has shown 10.95% far greater than the finding of previous study (22). The significantly high percentages of refractive errors specifically myopia found in our study comparative to other country is probably related to the increased demands for academic schedules and less awareness demands attention of health authorities specially school health service providers. This could represent a risk factor for developing refractive errors in this age group. **Conclusion:** Refractive error can no longer be ignored as a target for urgent action. The world must make every effort to meet the goals of VISION 2020. A child's whole life may get ruined just because of uncorrected or inappropriately corrected Refractive error. There is dire need of public awareness regarding refractive errors and availability of services. Cross referral and linkage with education and development sector is mandatory. The results show a great burden of refractive error patients on the hospital, so the facilities of the refractive services need to be increased.

REFERENCES

- Kandel H, Khadka J, Goggin M, Pesudovs K. Impact of refractive error on quality of life: a qualitative study. *Clinical & experimental ophthalmology*. 2017;45(7):677-88.
- Morgan IG, Rose KA, Ellwein LB, Group RESiCS. Is emmetropia the natural endpoint for human refractive development? An analysis of population- based data from the refractive error study in children (RESC). *Acta ophthalmologica*. 2010;88(8):877-84.
- Stein HA, Stein RM, Freeman MI. *The Ophthalmic Assistant E-Book: A Text for Allied and Associated Ophthalmic Personnel*: Elsevier Health Sciences; 2017.
- de Jong P. Myopia: its historical contexts. *The British journal of ophthalmology*. 2018;102(8):1021-7.
- Morgan IG, French AN, Ashby RS, Guo X, Ding X, He M, et al. The epidemics of myopia: Aetiology and prevention. *Progress in retinal and eye research*. 2018;62:134-49.
- Hagen LA, Gjelle JVB, Arnegard S, Pedersen HR, Gilson SJ, Baraas RC. Prevalence and Possible Factors of Myopia in Norwegian Adolescents. *Scientific reports*. 2018;8(1):13479.
- Veritti D, Sarao V, Lanzetta P. Optimal Keratoplasty for the Correction of Presbyopia and Hypermetropia. *Journal of ophthalmology*. 2017;2017:7545687.
- Aydin R, Karaman Erdur S, Serefoglu Cabuk K, Karahan E, Kaynak S. Comparison of Optical Low Coherence Reflectometry Versus Ultrasonic Biometry in High Hypermetropia. *Eye & contact lens*. 2018;44 Suppl 1:S115-S7.
- Myron Yanoff MD iO. *Optics of the Human Eye*. 2019.
- The Ophthalmic Assistant (Ninth Edition)-Refractive errors and how to correct them. 2013;Chapter 10 Pages 173-97.
- Mocanu V, Horhat R. Prevalence and risk factors of amblyopia among refractive errors in an Eastern European population. *Medicina*. 2018;54(1):6.
- Abdullah AS, Jadoon MZ, Akram M, Awan ZH, Azam M, Safdar M, et al. Prevalence of uncorrected refractive errors in adults aged 30 years and above in a rural population in Pakistan. *Journal of Ayub Medical College Abbottabad*. 2015;27(1):8-12.
- Abbasi S, Imtiaz A, Shah AR, Zamir Q. Frequency of amount and axis of astigmatism in subjects of Rawalpindi, Pakistan. *JPMA The Journal of the Pakistan Medical Association*. 2013;63(11):1370-3.
- Tayyab A, Afzal F, Masrur A, Naseem K. Analysis of retinal nerve fibre layer changes in anisometropic amblyopia by Heidelberg retina tomograph. *JPMA The Journal of the Pakistan Medical Association*. 2013;63:1491-5.
- Parrey MUR, Elmorsy E. Prevalence and pattern of refractive errors among Saudi adults. *Pakistan journal of medical sciences*. 2019;35(2):394.
- Hashemi H, Fotouhi A, Yekta A, Pakzad R, Ostadimoghaddam H, Khabazkhoob M. Global and regional estimates of prevalence of refractive errors: Systematic review and meta-analysis. *Journal of current ophthalmology*. 2018;30(1):3-22.
- Mohammed Alemam A, Aldebasi MH, Rehmatullah A, Alsaïdi R, Tashkandi I. Prevalence of Myopia among Children Attending Pediatrics Ophthalmology Clinic at Ohud Hospital, Medina, Saudi Arabia. *Journal of ophthalmology*. 2018;2018:3708409.
- Guan H, Yu NN, Wang H, Boswell M, Shi Y, Rozelle S, et al. Impact of various types of near work and time spent outdoors at different times of day on visual acuity and refractive error among Chinese school-going children. *PLoS one*. 2019;14(4):e0215827.
- Gopinathan G, Dhiman KS, Manjusha R. A clinical study to evaluate the efficacy of Trataka Yoga Kriya and eye exercises (non-pharmacological methods) in the management of Timira (Ammetropia and Presbyopia). *Ayu*. 2012;33(4):543.
- Alkahiry S, Siddiqui F. Prevalence of Amblyopia in children in Karachi, Pakistan? A Hospital based study. *Pakistan Journal of Ophthalmology*. 2016;32(3).
- Harrington SC, Stack J, Saunders K, O'Dwyer V. Refractive error and visual impairment in Ireland schoolchildren. *British Journal of Ophthalmology*. 2019;103(8):1112-8.
- Misra S, Baxi R, Damor J, Prajapati NB, Patel R. Prevalence of visual morbidity in urban primary school children in Western India. *Innovative Journal of Medical and Health Science*. 2013;3(4):193-6.
- Saleem K, Saleem P, Rabbani A. Prevalence of Refractive Error in Government Primary. *Journal of eoples University of Medical & Health Sciences*. 2018;8(3):162-7.
- Pan CW, Wu RK, Li J, Zhong H. Low prevalence of myopia among school children in rural China. *BMC ophthalmology*. 2018;18(1):140.
- Hassan B, Ahmed R, Li B, Noor A, Hassan Zu. A comprehensive study capturing vision loss burden in Pakistan (1990-2025): Findings from the Global Burden of Disease (GBD) 2017 study. *PLoS one*. 2019;14(5):e0216492.
- Latif MZ, Khan MA, Afzal S, Gillani SA, Chouhadry MA. Prevalence of refractive errors: an evidence from the public high schools of Lahore, Pakistan. *JPMA*. 2019;69(464).
- Varma R, Torres M, McKean-Cowdin R, Rong F, Hsu C, Jiang X, et al. Prevalence and risk factors for refractive error in adult Chinese Americans: the Chinese American Eye Study. *American journal of ophthalmology*. 2017;175:201-12