

Prevalence and Pattern of Refractive Error in 5-15 years age group in Bundelkhand

Dr. Jitendra Kumar¹, Dr. Punam Tiwari²

¹. Associate Professor & Head, Dept. of ophthalmology, MLB Medical College Jhansi, India.

². Junior Resident, Dept. of ophthalmology, MLB Medical college Jhansi, India.

Corresponding Author: Dr. Jitendra Kumar

Abstract- Refractive error is one of the leading causes of visual disability in children which can affect the performance and impair the quality of life and can lead to childhood blindness. A cross sectional study was conducted among children between 5 to 15 years of age who were attending OPD, Department of Ophthalmology, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India over a period of 6 months from March 2018 to August 2018 to find out the prevalence and pattern of refractive error among them. A total of 1357 children were attending the OPD. All children underwent thorough examinations. Out of this 252 children were diagnosed to have refractive error. Among this 156 were males and 96 were females. Prevalence of refractive error is 18.6% of children in 5-15 year age group. It is more prevalent in females (20.8%) than males (17.4%). This study shows that myopia, hypermetropia, and type of astigmatism have different distribution in different age groups like Hypermetropia is more common in 5-10 year age group (66%) whereas myopia is more prevalent in 11-15 year age group (67.7%).

Key Words: Children, Hypermetropia, Myopia, Astigmatism, Refractive error.

Date of Submission: 30-09-2018

Date of acceptance: 14-10-2018

I. Introduction

Refractive errors are optical defects of the eye where the incident parallel rays of light are not brought to a sharp focus onto the light-sensitive layer of the retina with accommodation at rest. Childhood visual impairment due to refractive errors is one of the most common problems among school-age children and is the second leading cause for treatable blindness [1]. Vision 2020: The Right to Sight, a global initiative launched by a coalition of non-government organizations and the World Health Organization (WHO) [2], is to eliminate avoidable visual impairment and blindness on a global scale. Uncorrected refractive errors can affect performance at school, reduce employability and productivity, and generally impair quality of life [3]. World health organization (WHO) estimated that 19 million children have vision impairment. Out of them, 12 million children have vision impairment due to refractive error. The major global causes of moderate to severe visual impairment are uncorrected refractive errors 53%, cataract 25%, age related macular degeneration 4%, glaucoma 2%. Uncorrected refractive error contributes to 21% of blindness.[4] Blindness is one of the significant social problems in India. About 80% of it is avoidable blindness, but a large number of those affected remain blind due to lack of access to eye care. An impairment of vision is defined as a patient having best corrected visual acuity less than 6/18 in the better eye. Blindness is defined by WHO as visual acuity less than 3/60 with best possible correction in the better eye on Snellen visual acuity chart. Myopia is the commonest refractive error in school children.[5] Other refractive errors are Hypermetropia and Astigmatism. Children do not normally complain of visual problems as they adjust to the poor eyesight by sitting near the blackboard, holding the book closer to their eyes, squeezing the eyes and even avoiding work requiring visual concentration [6]. Sometimes even the child complains of earliest signs of refractive errors like eye strain with or without redness, with watering and headache may go unnoticed to the parents due to lack of awareness among them.[7] Importance of early detection and treatment of ocular diseases and visual impairment in young children lies in the fact that 30% of India's population becomes blind before the age of 20 years.[8]

Refractive errors are frequently categorized as spherical errors or cylindrical.

Spherical ones occur when the optical power of the eye is either too large or too small to focus light on the retina. Cylindrical errors occur when the optical power of the eye is too powerful or too weak across one meridian of the optics. Refractive errors can be classified as myopia, hypermetropia and astigmatism [9].

The three basic types are discussed as below.

1 Hyperopia-Hyperopia is also referred to as hypermetropia or far sightedness. In this type of spherical refractive error an image of a distant object is focused behind the retina either because the eyeball axis is too short or because the refractive power of the cornea and the lens are insufficient.

2 Myopia-Also referred to as near or short sightedness, is a refractive defect of the eye in which collimated light produces image focus in front of the retina when accommodation is relaxed. Distant objects appear blurred. Myopia is the commonest refractive error seen in children. It rarely occurs below the age of 5 years.

3 Astigmatism-Astigmatism is a refractive error of the eye in which there is a difference in degrees of refraction in the different meridians (corneal surface or the lens). Lens astigmatism is common in the elderly. Astigmatism causes difficulties in seeing fine detail. The prevalence of astigmatism increases with age.

II. Method and Material

All children of age group 5 to 15 years who were attending OPD were included in this cross-sectional study conducted in the Department of Ophthalmology, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh, India over a period of 6 months from March 2018 to August 2018. The procedures followed were in accordance with the ethical standards committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000. The necessary permission from the Ethical and Research Committee was obtained for the study.

A thorough history was taken regarding asthenopic symptoms and previous history of ocular disease including history of wearing glasses before was given due consideration. All children underwent the following examinations in the following sequence: Vision was measured with the child wearing their glasses if the child already had glasses on presentation, visual acuity measurement of each eye separately (unaided and with a pin-hole), extra-ocular movement assessment, cover test, cover-uncover test, anterior segment examination with a loupe and a torch light, refraction using a Heine retinoscope and with an auto refractometer, and fundus examination using a direct ophthalmoscope. Visual acuity was measured with a Snellen letter optotype. All patients having visual acuity less than or equal to 6/9 or having asthenic symptoms or with other symptoms of refractive errors undergo dilated retinoscopic examination which was done using 1% Cyclopentolate and 1% Tropicamide eye drops applied in a C-T-C pattern, with five minutes between applications (CTC protocol), so that any type of hidden refractive errors could not be missed. Cycloplegia was considered complete if the pupils were dilated more than 6 mm. Refraction was performed using a streak retinoscope in a semi dark room at a distance of 50 cm. Objective refraction (retinoscope) followed by subjective refraction till the best corrected visual acuity was achieved.

The children's age, sex and clinical diagnosis was retrieved. The diagnosis of patients was grouped into myopia, hyperopia, myopic astigmatism, hyperopic astigmatism and mixed astigmatism. Myopia was considered when the measured refraction was more than or equal to -0.5 spherical equivalent diopters in one or both eyes. Hypermetropia was considered when the measured objective refraction was greater than or equal to $+1.00$ spherical equivalent diopters in one or both eyes. Astigmatism was considered to be visually significant if ≥ 1.00 D.

Inclusion criteria:

1. Actual age was 5-15-years old on the day of examination,
- 2) Signed an informed consent taken from parents or legal guardians,
- 3) There was no history of systematic cardiovascular or nervous diseases, such as congenital heart diseases, hypoxic-ischemic encephalopathy, and learning difficulties.

Exclusion criteria:

- 1) Children who had eye injuries or eye diseases (e.g., corneal opacities, cataracts, fundus pathology, etc) that affected visual functions,
- 2) Children who had a history of untreated closed-angle glaucoma or untreated anatomically narrow angle - information obtained from anterior segment examination and medical history,
- 3) Children who were allergic to any ingredient in 1% cyclopentolate solution,
- 4) Children who refused to continue the examinations due to eye discomfort during cyclopentolate administration (e.g., burning, photophobia, irritation),
- 5) Children who moved eyeballs excessively during examination.

III. Results

In this study, all children of the age group 5 to 15 years were included and examined who were attending the OPD. Total of 1357 children were there, 896 were males and 461 were females. Out of these 252 children were diagnosed to have refractive error. Among this 156 were males and 96 were females. Refractive error was found in 18.6% children attending OPD. Prevalence of refractive error was 17.4% in males and 20.8% in females.

Table 1: Distribution of refractive error according to age and sex

Age group (years)	5-10 years	11-15 years	Total
Male	63(67%)	93(58.9%)	156(62%)
Female	31(33%)	65(41.1%)	96(38%)
Total	94(100%)	158(100%)	252(100%)

Age wise distribution showed that 37.3% of children were in 5-10 year group and 62.7% of children were in 11-15 year age group have refractive error.

Table 2: Distribution of different refractive errors according to age group

Types of refractive error	Age-group		Total
	5-10 years	11-15 years	
Simple myopia	6(6.4%)	48(30.4%)	54(21.5%)
Simple Hypermetropia	15(16%)	11(7%)	26(10.3%)
Myopic astigmatism	25(26.6%)	59(37.3%)	84(33.3%)
Hypermetropic astigmatism	47(50%)	39(24.7%)	86(34.1%)
Mixed astigmatism	1(1%)	1(0.6%)	2(0.8%)
Total	94(100%)	158(100%)	252(100%)

In 5-10 years of age group, hypermetropia was more prevalent(66%) in comparison to myopia(33%) whereas in 11-15 years of age myopia was more prevalent(67.7%) in comparison to hypermetropia. Simple myopia was(21.5%) of total refractive error diagnosed. Age wise distribution showed that it was more prevalent in 11-15 year age group(30.4%) in comparison to its prevalence in 5-10 years group(6.4%). Overall data shows that simple hypermetropia was(10.3%) of all cases of refractive error. Age wise distribution showed that it was more common in 5-10 years age group (16%). Myopic astigmatism was the second most common(33.3%) type of refractive errors and it was more common(37.3%) in 11-15 years age group. Hypermetropic astigmatism (34.1%) was most prevalent refractive error, It was more common (50%) among 5-10 years age group in comparison with 11-15 years age group (24.7%). Mixed astigmatism was least common error. It was noted in only (0.8%) of cases, and was more (1%) in 5-10 years age groups.

Table 3: Distribution of refractive error according to sex

Types or refractive errors	Males	Female
Simple myopia	28(18%)	12(12.5%)
Simple hypermetropia	16(10.2%)	8(8.3%)
Myopic Astigmatism	52(33.3%)	36(37.5%)
Hypermetropic Astigmatism	58(37.2%)	39(40.7%)
Mixed Astigmatism	2(1.3%)	1(1%)
Total	156(100%)	96(100%)

Among males hypermetropic astigmatism was most common (37.2%) followed by myopic astigmatism (33.3%). Among females also hypermetropic astigmatism was most common (40.7%) followed by myopic astigmatism (37.5%).

IV. Discussion

The present study was a hospital based study conducted in the OPD premises . In our study (66%) were male and (34%) were female. The refractive error was more in female (20.8%) compared to male (17.4%). Seema et al. reported little higher pre-valence of refractive error as 23.7% in female and only 12.2% in males[10]. Similar results were observed by Pavithra et al. where prevalence in female children (9%) compared to male children (5.3%) showing little lesser prevalence in female compared to male[11] another study with similar reports in India is by Prema et al with 17.2% females and 13.4% males[12]

In present study hypermetropia is more prevalent in 5-10 years age group however myopia is more prevalent in 11-15 years age group. This distribution in two different age groups is due to progressive shift towards myopia with increasing age. In present study prevalence of astigmatism is slightly higher(Myopic astigmatism -31.19% and Hypermetropic astigmatism- (32.96%). Similar results have been reported from Qatar(70%) (Al-Naimi et al., 2010)[13], Ghana (49.3%) (Ovenseri-Ogbomo&Assien, 2010)[14], Jordan (20.4%) (Bataineh&Khatatbeh 2008)[15], Pakistan (35.5%) (Ali et al., 2007)[16] and in Nepal(9.2%) (Pokharel, 2010)[17]. In our study, myopic astigmatism is more prevalent in 11-15 years of age group and hypermetropic astigmatism is more prevalent in 5-10 years age group. However contribution of mixed type of astigmatism is very less amounting about (1.3%) similar results has been reported by Shanti Pandey et al. in 2016[18].

V. Conclusion

Early detection and treatment of refractive error is essential in children to improve quality of life and to prevent blindness. Present study shows that female children have a higher (20.8%) proportion of refractive errors than males (17.4%) and myopia, hypermetropia, and type of astigmatism have different distribution in different age group like myopia is more common in older children and hypermetropia is more common in younger age group.

References

- [1]. Prevalence of refractive error in school children of Karachi. Prevalence of refractive error in school children of Karachi. *J Pak Med Assoc.* 2008; 58: 322-325.
- [2]. Pizzarello L, Abiose A, Ffytche T, et al. Vision 2020: the right to sight: a global initiative to eliminate avoidable blindness. *Arch Ophthalmol* 2004;122:615-620.
- [3]. Serge Resnikoff et al. Global magnitude of visual impairment caused by uncorrected refractive errors, *Bulletin of the World Health Organization*, 2008, 86: 63–70
- [4]. Visual impairment and blindness Fact Sheet. Fact sheet no 282. World Health Organisation 2017
- [5]. Gupta M, Gupta BP, Chauhan A, Bharadwaj A. Ocular morbidity prevalence among schoolchildren in Shimla, Himachal, North India. *Indian J Ophthalmol.* 2009;57(2):133-38.
- [6]. Vision screening in school children. Training module. Danish Assistance to the National Programme for Control of Blindness. New Delhi, India.
- [7]. Vinay BS, Shruthi BN. Prevalence of refractive error and other ocular morbidities among school going children aged 9-16 yrs in rural area of Mandya, Karnataka, India. *International Journal of Contemporary Pediatrics* 2016; 3(2):509-513.
- [8]. Gupta Y, Sukul RR, Guptha M, Phougat A, Jain R, et al. School eye survey in rural population in UP, India, *Nepal Journal of Ophthalmology.* 2011;3(5):78-9.
- [9]. Abrams D. Duke-elder's practice of refraction. 10th edn. New Delhi: B.I. Publication Pvt Ltd 1993: P. 3.
- [10]. Seema S, Vashisht BM, Meenakshi K, Manish G. Magnitude of Refractive Errors among school children in a rural block of Haryana. *Internet J Epidemiol* 2008;6:214.
- [11]. Pavithra MB, Maheshwaran R, Rani Sujatha MA. 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;2:641-5
- [12]. Prema, N. (2011). Prevalence of refractive errors in school children. *Indian Journal Science Technology*, 4, 9.
- [13]. AL-Nuaimi, A. A., Salama, R. E., & Eljack, I. E. (2010). Study of refractive errors among school children Doha. *World Family Medicine Journal*, 8(7), 41-48.
- [14]. Ovenseri-Ogbomo, G. O., & Assien, R. (2010). Refractive error in school children in Agona Swedru, Ghana. *South African Journal of Optometry*, 69(2), 86-92.
- [15]. Bataineh, H. A., & Khatatbeh, A. E. (2008). Prevalence of Refractive Errors in School Children. *Sudanese Journal of Public Health*, 3(4), 23-29.
- [16]. Ali, A., Imran, A., & Ayub, S. (2007). Prevalence of uncorrected refractive errors among school children, *E:/Biomedica*, 23. Retrieved from <http://thebiomedicapk.com/articles/118.pdf>.
- [17]. Pokharel, A., Pokharel, P. K., Das, H., & Adhikari, S. (2010). The patterns of refractive errors among the school children of rural and urban settings in Nepal, *Nepalese Journal of Ophthalmology*, 2(2), 15-27. <http://dx.doi.org/10.3126/nepjoph.v2i2.3717>.
- [18]. Shanti Pandey et al. in 2016. Pattern of refractive errors in 5 - 15 year age children at tertiary care centre. In Kumaon region, *Indian Journal of Clinical and Experimental Ophthalmology*, 2(2): 158-161.

Benwoke Ihunwo IW. "Gender Determination Using Volume of the Clavicle in Nigerian Population" *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 17, no. 10, 2018, pp 08-11.