

Patterns of refractive error: prevalence and distribution of anisometropia

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Abstract:

Worldwide, large uncorrected refractive errors are deemed to be the largest cause of moderate and severe visual impairment as per the ICD-10 classification. In Pakistan it was found to be around 8.9% among school children. Refractive errors can be broadly classified as myopia, hypermetropia, astigmatism and compound mixed astigmatism. However, difference in refractive errors of both eyes is known as anisometropia. Anisometropia presents further challenges in correction and prevention of amblyopia. The burden of disease is vast; from limiting an individual's educational and social advancement, to restricting income and overall quality of life.

Objective: This study aims to record the patterns of refractive errors in persons aged between 5 and 25 years, seen in an ophthalmology out-patients department in an urban area of Pakistan
Methods: This was a cross sectional descriptive study of 1126 patients with refractive errors aged between 5-25 years, presenting to the Ophthalmology Department of Liaquat National Hospital, Karachi.

Results: Of 1126 patients with refractive errors, 52.4% were females and 47.6% were males. 78.2% had myopia, 14.4% had hypermetropia and 7% had mixed refractive errors. 59.1% had astigmatism and 40.9% had pure spherical errors.

Only 22 patients i.e. 2% of the total had spherical anisometropia. While 3.7% of patients (42 patients had significant cylindrical anisometropia.

Conclusion: In contrast to studies conducted among Pakistani school children or college students (47%), our study showed a higher distribution of myopia (78.2%). Our study found no particular difference in the prevalence of refractive errors between the two genders

Keywords: Anisometropia, astigmatism, spherical errors, myopia, hypermetropia

Introduction:

Refractive errors comprise a significant proportion of ophthalmological morbidity all over the world, especially in developing countries such as Pakistan. The striking thing is that most of these can be remedied simply and quite inexpensively.

Worldwide, large uncorrected refractive errors are deemed to be the largest cause of moderate and severe visual impairment¹ as per the ICD-10 classification. The prevalence of smaller refractive errors is even greater; various studies have found this to range between 5%² and 84%.³ In Pakistan it was found to be around 8.9%⁴ among school children. Refractive errors can be broadly classified as myopia, hypermetropia,

astigmatism and compound mixed astigmatism. However, difference in refractive errors of both eyes is known as anisometropia. Anisometropia presents further challenges in correction and prevention of amblyopia. The burden of disease is vast; from limiting an individual's educational and social advancement, to restricting income and overall quality of life.

This study aims to record the patterns of refractive errors in persons aged between 5 and 25 years, seen in an ophthalmology out-patients department in an urban area of Pakistan. No such study has been previously done regarding different types of refractive errors with special focus on anisometropia, its prevalence and its

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Table-1: Association of different characteristics with gender

	Total	Gender		p-value
		Male 536(47.6%)	Female 590(52.4%)	
Astigmatism				
Yes	665(59.1)	336(50.5)	329(49.5)	0.018*
No	461(40.9)	200(37.3)	261(44.2)	
Type of refractive error				
Myopia	880(78.2)	407(75.9)	473(80.2)	0.303**
Hypermetropia	162(14.4)	82(15.3)	80(13.6)	
Both	7(0.6)	4(0.7)	3(0.5)	
None	77(6.8)	43(8.0)	34(5.8)	
Astigmatism				
≤ 2 diopter	1084(96.3)	515(96.1)	569(96.4)	0.751**
> 2 diopter	42(3.7)	21(3.9)	21(3.6)	
Anisometropia				
≤ 2 diopter	1104(98.0)	523(97.6)	581(98.5)	0.276**
> 2 diopter	22(22.0)	13(2.4)	9(1.5)	

Chi-Square test is applied

*P-value ≤ 0.05 consider as significant

**Insignificant at >0.05

Table-2: Association of different characteristics with Age Group

	Total	Age Group			p-value
		< 14 yrs 269(23.9%)	14 - 50 yrs 458(40.7)	> 50 yrs 399(35.4%)	
Astigmatism					
Yes	665(59.1)	162(60.2)	269(58.7)	234(58.6)	0.092**
No	461(40.9)	107(39.8)	189(41.3)	165(41.4)	
Type of refractive error					
Myopia	880(78.2)	174(64.7)	380(83.0)	326(81.7)	<0.001*
Hypermetropia	162(14.4)	71(26.4)	42(9.2)	49(12.3)	
Both	7(0.6)	5(1.9)	1(0.2)	1(0.3)	
None	77(6.8)	19(7.1)	35(7.6)	23(5.8)	
Astigmatism					
≤ 2 diopter	1084(96.3)	256(95.2)	445(97.2)	383(96.0)	0.366**
> 2 diopter	42(3.7)	13(4.8)	13(2.8)	16(4.0)	
Anisometropia					
≤ 2 diopter	1104(98.0)	259(96.3)	452(98.7)	393(98.5)	0.056**
> 2 diopter	22(22.0)	10(3.7)	6(1.3)	6(1.5)	

Chi-Square test is applied,

*P-value ≤ 0.05 consider as significant

**Insignificant at >0.05

relation to gender and age groups.

Materials and Methods:

This was a cross sectional descriptive study of patients presenting to the Ophthalmology De-

partment of Liaquat National Hospital, Karachi from October 2015 to November 2016. Sample size was calculated from WHO calculator, total sample size was 125 patients using precision 8.9%, margin of error 5% and confidence interval 95%.

Verbal informed consent, from all patients or parents of underage children was obtained for collection of data. Only patients within the age group 5-25 years and who presented for a simple refractive check up, were included in this study. All those suffering from ocular diseases, trauma and ocular conditions like squint, congenital cataract and congenital glaucoma, were excluded.

All demographic information like name, age, sex was recorded and a detailed history was taken. Pre-existing refractive errors and usage of glasses was documented. Examination was done including Snellen's chart for distance vision and a hand held chart for near vision to determine the refractive error and to plan the management accordingly. All this information was collected on a specially designed proforma (attached in the end). This study was conducted after the approval of ethics committee of Liaquat National Hospital. Data was then entered and analyzed on SPSS version 21.00. Statistical Package for the Social Sciences Software (SPSS, version 21) is used for analysis. Quantitative variables were presented as mean and standard deviation. Qualitative variables were presented in terms of frequency and percentages. Chi square test was applied for finding association between categorical variable. P-value ≤ 0.05 were considered as significant.

Results:

Of 1126 patients with refractive errors, 52.4% were females and 47.6% were males. 78.2% had myopia, 14.4% had hypermetropia and 7% had mixed refractive errors (one eye is myopic and other is hypermetropic). 59.1% had astigmatism and 40.9% had pure spherical errors.

Only 22 patients i.e. 2% (9 females and 13 males) of the total had spherical anisometropia (more than 2 D difference in both eyes). While 3.7% of patients (42 patients, 21 females and 21 males)

had significant cylindrical anisometropia (more than 2 D difference in both eyes). When compared type of refractive error was found to significantly associated with age group ($p < 0.001$) and occurrence of astigmatism was significantly associated with gender ($p < 0.018$)

Discussions:

Around 1.4 million children in the world are blind. One million of them belong to Asia and half a million approximately is added to this total every year, at the rate of one blind child every minute.⁵ Congenital diseases, uncorrected refractive errors, vitamin A deficiency and trachoma are few of the main causes of blindness in children. Childhood blindness exerts an incalculable toll on the individuals family and society at large, since the various physical, socio-economic, psychological and emotional burdens are vast and long term.

In contrast to studies conducted among Pakistani school children or college students (47%), our study showed a higher distribution of myopia (78.2%) since our sample consisted of symptomatic individuals presenting to an Ophthalmology department for reasons including blurred vision. Prevalence rates in Asian countries vary from 50% in Chinese children to 84% in Taiwan and Hong Kong.⁶ In Singapore, the prevalence of myopia is immense, affecting 28% of early school aged children and 70% of university students.⁷

Anisometropia is a leading cause of amblyopia, a complication that has devastating effects on one's life with little to no treatment options available.

According to the 2012 guidelines of the American Association for Pediatric Ophthalmology and Strabismus (AAPOS), children of different ages can tolerate varying amounts of hyperopia before developing anisometropia, as growth and development of children entails an expected increase in axial length and subsequent reduction in hyperopia, which may cause anisometropia to also lessen as they age. The AAPOS guidelines specify that for children aged 12-30 months the

risk for amblyopia is greatest if there is anisometropia greater than +2.5 diopters. For children aged 31-48 months anisometropia greater than +2.0 diopters confers significant risk factor. A difference of more than +1.5 diopters between both eyes in a child older than 49 months is predictive of amblyopia.

Bearing in mind that our participants comprised of symptomatic individuals, it is worth noting that the burden of disease is expected to be fairly high among the non privileged classes who tend to be dismissive of minor symptoms and screening programmes. It is the need of the hour that there should be regular and mandatory screening programs of refractive errors for children about to start school (2-5years) because prognosis is most favourable for this age group. We focused on anisometropia in detail because as far as refractive errors go anisometropia is harder to treat. Such patients are more susceptible to debilitating complications like amblyopia, while being less tolerant of any corrective measures. Anisometropia can be variously treated by spectacles, contact lenses and surgical procedures like LASIK or intra-ocular clear lens exchange.

Simple refractive errors (myopia and hypermetropia) need correction as they also affect the visual acuity significantly and thus the school performance and social development of these young children.

Blepharitis, Vernal keratoconjunctivitis and allergic conjunctivitis, all seemingly benign conditions cause itching and eye rubbing, which leads to cylindrical refractive error or astigmatism. A cylindrical error of even 0.5D is enough to cause a headache, discomfort or strain.

Conclusion:

Refractive error no matter minor have a huge impact on social and psychological aspects of life. The first line of treatments is cheap and effective and mostly easily tolerated. However if not treated the consequences can be dire and irreversible. Despite much effort, our population, need further education and extensive and more sensitive screening programs. It is our sugges-

tion that every child of 3 of age should undergo cycloplegic refraction for early detection and prompt treatment

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Role and contribution of authors:

Dr. Abdul Hameed Siddiqui, collected the data and references.

Dr. Maria Khan, collected the references, made the changes in the discussion, result, and conclusion.

Dr. Marium Hussain, collected the data, references and helped in discussion writing.

Dr. Afshan Mateen, critically review the article and gave useful suggestions.

Dr. Asmatullah Khan, critically review the article and made the final changes.

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