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PREVALENCE OF REFRACTIVE ERRORS BY AGE AND GENDER IN PATIENTS REPORTING TO OPHTHALMOLOGY DEPARTMENT.

Adeel Ahmed Siddiqui[1], Muhammad Ajmal Chaudhary[2], Muhammad Zafar Ullah[3], Majid Hussain[4], Nadeem Ahmed[5], Abida Hanif[6]

1. MBBS, FCPS
Consultant Ophthalmologist
Tehsil Headquarter Hospital,
Kabirwala.
2. MBBS, FCPS
Assistant Professor Paediatric Ophthalmology
The Children's Hospital and
The Institute of Child Health, Multan.
3. MBBS, FCPS
Associate Professor Ophthalmology
Nishtar Medical University, Multan.
4. MBBS, FCPS
Associate Professor Ophthalmology
Nishtar Medical University, Multan.
5. MBBS, FCPS
Senior Registrar Ophthalmology
Nishtar Medical University, Multan.
6. M.Sc, M.Phil
Assistant Librarian
COMSATS University Islamabad,
Vehari Campus, Vehari.

Correspondence Address:
Dr. Muhammad Ajmal Chaudhary
Department of Paediatric Ophthalmology
The Children's Hospital and
The Institute of Child Health, Multan.
ajmal15571@hotmail.com

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ABSTRACT… Objectives: To determine the age and gender specific prevalence of different refractive errors in the patients presenting to the Ophthalmology Departments of the tertiary care hospital. **Study Design:** Analytical Cross-sectional study. **Setting:** Departments of Outpatient Ophthalmology at THQ Hospital Kabirwala, The Children's Hospital & The Institute of Child Health Multan and Nishtar Hospital, Multan. **Period:** January 2020 to May 2020. **Material & Methods:** A total of 400 patients ≥ 4 years age of either gender were included. Patients with history of ocular surgery, trauma and advanced fundus disease were excluded. Age and gender of the patients was noted. Clinical examination and autorefraction were carried out. Quantitative data is presented as mean ± SD and qualitative data as frequency and percentages. Chi-square test is used to assess the association of refractive errors with age groups and gender. **Results:** Median age of the participants was 20 years (range 04 – 92 years). Males constituted 58% (n = 232) of the study participants. Most common refractive error were astigmatism (n=298, 74.5%) and myopia in 187 (46.75%) patients. Prevalence of myopia was significantly higher (p-value < 0.001) in 11-20 (39.6%) and 21-40 (34.2%) years age group and in males (64.7%, p-value 0.01). Hypermetropia was significantly higher (p-value <0.001) in 4-10 (36.8%) and ≥ 41 (38.7%) years age group with no gender predilection. **Conclusion:** This study shows prevalence of myopia being highest in males age 11-40 years and prevalence of hypermetropia being highest in children between 4-10 year and elderly ≥ 41 year with no gender predilection.

Key words: Astigmatism, Hypermetropia, Myopia, Refractive Error.

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INTRODUCTION

Refractive error is the most common ophthalmic condition presenting to an ophthalmologist in clinical setting. It is the condition of eye in which the refracted rays do not come to a focus on the retina and lead primarily to blurring of vision and many other secondary side effects.[1] According to World Health Organization (WHO) estimates about 153 million people across the globe are affected by refractive errors. Of these eight million are blind and 145 million have significant distance visual impairment (equivalent to < 6/18 in the better eye) due to uncorrected refractive error.[2] Understanding the significance of refractive error morbidity, WHO and the International Agency for the Prevention of Blindness (IAPB), started their joint initiative vision 2020: The right to sight.[3]

Refractive errors accounts for as much as 75% of overall impairment of vision in high income areas. Minor reduction in vision (< 6/12) has been associated with an increased risk of death and physical, social & psychological problems in people older than fifty years.[4] A study highlighted that complication due to refractive errors in the form of the co-morbidities and the rehabilitative measures led to utilization of 26.8 billion international dollars.[5] The crude prevalence of myopia, hypermetropia and astigmatism in persons greater than 30 year of age in Pakistan was found to be 36.5%, 27.1% and 37.1 % respectively.[6] The prevalence of spectacle wear among phakic was 4.0% and in aphakic patients it was 41.7%. The overall spectacle wearing was 15%.[7] In a school based cross sectional analytical study 2491 were enrolled. Refractive errors were

detected in 235 (9.4%) children. Most common refractive error was myopia in 42.2%. However, in children < 10 years of age simple astigmatism was most common (40.5%) and in ≥ 10-years group myopia was more prevalent (46.6%).[8]

Poor vision in children and adults affects performance in school or at work respectively resulting in a negative impact on the present and future career. The planning of eye care programs requires data on the prevalence and distribution of refractive errors. Limited data on age and gender distribution of refractory errors in Pakistani population is available required to plan strategies for the increasing awareness and education of the patients and parents about refractive errors and to transform this increased awareness to actual utilization of services. The study aims to determine the age and gender specific prevalence of refractive errors in patients presenting at three tertiary care eye hospital settings in South Punjab, Pakistan.

MATERIAL & METHODS

This cross-sectional analytical study was conducted from January 2020 to May 2020 in the Outpatient Departments of Ophthalmology at Tehsil Headquarter Hospital (THQ), Kabirwala, The Children's Hospital & The Institute of child Health, Multan and Nishtar Hospital, Multan after permission from institutional ethical review committee of these institutions (CHC-1981 dated 03-01-2020). Using WHO sample size calculator, a sample size of 400 patients was calculated using 27.1% prevalence of hypermetropia in Pakistan, 95% confidence level and 4.4% margin of error. Patients presenting with problems of visual acuity in the refraction room and ≥ 4 years of age were enrolled consecutively after informed written consent. Parents / Guardian provided the consent for minor (≤ 12-year-old children). Baseline demographic data name, age, gender and address were recorded.

All patients underwent clinical examination for visual acuity, anterior segment and fundus. In children (4 -12 year) cyclopentolate eye drops were instilled three time after 10 minutes interval. All the participants were subjected to auto-refraction technique using Topcon and Cannon autorefraction machines. Refractive error was labelled as Myopia if error greater than 0.5D with minus sign, as hypermetropia if error greater than 0.5D with plus sign and astigmatism if greater than 0.5D difference between two meridians. Astigmatism was further categorized into myopic, hypermetropic and mixed variety. All the examinations were supervised by a consultant ophthalmologist. All the obtained data was recorded on performa specifically designed for the study.

Data were entered and analyzed through SPSS version 23. Median and range is reported for age of the patients. Study participants were equally grouped (n=100 each) on age categories of 4-10 years, 11-20 years, 21-40 years and ≥ 40 years. Frequencies and percentages have been calculated for gender, type of refractive error and categories of astigmatism. Cross-tabulations were done for age groups and gender with type of refractive error. Chi-square test was applied for assessment of significance with regards to age groups and gender and p-value ≤ 0.05 was taken as significant.

RESULTS

A total of 400 participants including 100 in each age group of 4-10, 11-20, 21-40 and ≥ 40 years participated in the study. Median age was 20 years with age range of 4 – 92 years. There were 58 % males (n=232) and 42 % (n=168) were females. Astigmatism prevailed the refractive errors with prevalence of 74.5% (n=298) followed by myopia 46.75% (n=187) and hypermetropia with prevalence of 40.75% (n=163) [Table-I]. Most common of the astigmatism variety was myopic astigmatism 47% (n=139) followed by hypermetropic astigmatism 36% (n=108) and mixed astigmatism was 17% (n=51).

Distribution of refractive error with respect to different age groups indicated that frequency of myopia is significantly higher in 11-20 years (n=74, 39.6%) and 21-40 years (n=64, 34.2%) compared to 4-10 year (17.1%) and ≥41 year age (9.1%) group (p-value < 0.001). Similarly, prevalence of hypermetropia was significantly

higher in 4-10 (n=60, 36.8%) and ≥ 41 year (n=63, 38.7%) age groups compared to 11-20 (n=19, 11.7%) and 21-40 (n=21, 12.9%) year age groups (p-value < 0.001). However, prevalence of astigmatism was not significantly different in any of the age groups (p-value – 0.06) [Table-II].

Frequency of myopia was significantly higher (p-value 0.01) in males (n=121, 64.7%) compared to females (n=66, 35.3%). But distribution of hypermetropia (53.4% vs. 46.6%) and astigmatism (58.4% vs. 41.6%) was not significantly different respectively (p-value 0.12 and 0.79) between males and females [Table-III].

DISCUSSION

Most common refractive error detected in our study was astigmatism followed by myopia. Myopia was prevalent in males age 11-40 years. Hypermetropia prevalent in below 10 years and above 40 years age groups and did not have any gender predisposition. Uncorrected refractive errors are the leading cause for moderate to severe vision impairment globally, and the second most common cause for blindness. Among the global population there were 216 million cases with moderate or severe vision impairment in 2015, the leading cause was uncorrected refractive error in 116 million cases.[9]

Refractive errors can lead to financial burden and economic insecurity in affluent countries to visual impairment and even blindness in poor countries.

Age, (median, range)	20, 4 – 92
Age groups,	**n, %**
4 – 10 years	100 (25)
11 – 20 years	100 (25)
21 – 40 years	100 (25)
> 40 years	100 (25)
Gender,	**n, %**
Males	232 (58)
Females	168 (42)
Types of Refractive Errors	**n, %**
Myopia	187 (46.75)
Hypermetropia	163 (40.75)
Astigmatism	298 (74.50)

Table-I. Characteristics of patients with refractive errors (N = 400)

According to a study, The global potential productivity loss associated with the burden of visual impairment in 2015 was estimated as USD 244 billion (95% confidence interval[9], USD 49 – 697 billion) from uncorrected myopia and USD 06 billion (95% CI, USD 02 - 17 billion) from macular degeneration.[5] According to a study done in Pakistan, refractive errors are one of the major causes of blindness in this country along with cataract, glaucoma, posterior capsular opacification, uncorrected aphakia, glaucoma and phthisis.[10]

Type	**Age groups (n=100 each))**				**P-Value***
	4 – 10 Years	**11 – 20 Years**	**21 – 40 Years**	**≥ 41 Years**	
Myopia (n = 187)	32 (17.1%)	74 (39.6%)	64 (34.2%)	17 (9.10%)	< 0.001
Hypermetropia (n = 163)	60 (36.8%)	19 (11.7%)	21 (12.9%)	63 (38.7%)	< 0.001
Astigmatism (n= 298)	75 (25.2%)	73 (24.5%)	66 (22.1%)	84 (28.2%)	0.06

Table-II. Association of refractive error type with age groups (N=400)
***Chi-square test of significance**

Type	**Gender of the patients**		**P-Value***
	Males	**Females**	
Myopia (n = 187)	121 (64.7%)	66 (35.3%)	0.01
Hypermetropia (n = 163)	87 (53.4%)	76 (46.6%)	0.12
Astigmatism (n= 298)	174 (58.4%)	124 (41.6%)	0.79

Table-III. Association of refractive error type with Gender (N=400)
***Chi-square test of significance**

Overall, there were 232 (58.2%) males and 168 (42.2%) were females. Some of the probable reasons are that female are less literate in our society. They cannot anticipate and express their problems and complementing to this is the fact that males in our society are more dominant, more literate, and more financially stable and are far more independent than their female counterparts with early access to health services.[11] Contrary to our study, female participation was higher (57.98%, n=1460) compared to males (42.02, n=1058) in population based study among adults from rural Iran.[12] This gender difference in participation could be due to differences in social and educational determinants.

A study from Landi Kotal (Pakistan) enrolled children between 01 - 15 years of age. The majority of the children were between 04-10 year age group and mostly males. It was found out that hypermetropia was present in 288 (58%) patients followed by myopia in 182 (36%) patients while astigmatism was found only in 30 (6%) children.[13] However, in our study the major refractive error in age group 4 – 10 years is hypermetropia and myopia in 11 - 20 years age group followed by astigmatism. This could be due to low patient numbers between 5 - 15 years age group and also because of the exclusion of patients between 16 - 20 years age group in the Landi Kotal study. Frequency of myopia in our study was significantly higher in 11-20 year age group (74%). A school-based study from Lahore also reported myopia in 54 % of the high school children.[14] Similarly, myopia was reported in 41 % of the children in 5-15 years age group by Rasheed et al.[15] Another survey of refractive errors among school going children in 5-16 years age group included 45,122 children. Myopia was the most common refractive error detected in 857 (1.89%).[16] A recent study from Faisalabad included 600 school going children and reported 51.5% prevalence of myopia.[17] Similarly, hypermetropia was common in 4-10 years age group and ≥ 41 years age group in our study. High frequency of hypermetropia (10.14%) was also reported among 1000 adults aged ≥ 30 years by Abdullah et al from Khyber Pakhtunkhwa.[18] However, contrary to our study myopia was highest in adult patients reported in 44.06 % (n=479) followed by astigmatism in 28.20% (n=307) in a study reported from DHQ Hospital Bannu.[19]

Myopia was significantly higher in male participants in our study and there was no difference regarding hypermetropia and astigmatism in either of the gender groups. However, a study from Dow University, Karachi, Pakistan that included 691 participants did not find any difference in refractive errors with regard to gender.[15] However, in a hospital-based study including 1824 subjects myopia was significantly high (p-value-0.003) in females (33.4%) compared to males (28.4%). High frequency of myopia in male participants of our study could possible due to low participation of females in our study.[20]

Being a large sample size study and equal representation from all age groups is the strength of our study. However, our study has certain limitations such as; it is not a population-based study and females participants had low turnover.

CONCLUSIONS

This study describes highest prevalence of hypermetropia in children between 4-10 year and elderly ≥ 41 year. Similarly, prevalence of myopia was highest in males with no gender predilection in cases of hypermetropia and astigmatism. The need of the hour is to increase the awareness of refractive errors as well improving the infrastructure in the hospitals for managing this problem.

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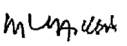
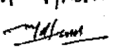
AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Adeel Ahmed Siddiqui	Study planning, designing, paper writing and editing.	
2	M. Ajmal Chaudhary	Study planning, designing, paper writing and editing.	
3	Muhammad Zafar Ullah	Proof - reading and editing.	
4	Majid Hussain	Data collection, paper writing and literature searching.	
5	Nadeem Ahmed	Data collection, paper writing and literature searching.	
6	Abida Hanif	Data entry and data analysis.