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Frequency And Type Of Refractive Errors Among The Teenage Groups Presenting In Eye OPD In Shaikh Zayed Hospital Lahore

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Abstract

Objective: To determine the frequency and type of refractive errors in the teenage groups reporting in ophthalmology department of Shaikh Zayed Hospital Lahore, Pakistan.

Methods: This descriptive study was conducted in the Shaikh Zayed Hospital, Lahore, Pakistan from 14-9-2023 to 14-02-24. Total 501 subjects of both genders with refractive errors were included in the study after fulfilling the inclusion criteria. . Participants were in the age group 11-19 years. Visual acuity was checked with Snellen chart. Subjective and objective refraction was performed. All participants underwent complete ophthalmic examination to rule out any ocular abnormality.

Results: In the study 287 (57.3 %) participants were females and 214 (42.7%) were males. Median age of the participants was 16 years. Myopia was most prevalent refractive error with total of 339 (67.7%) followed by astigmatism having total 148 (29.5%). while hyperopia was seen in 14 (2.8%) participant of the study population. There were no gender related differences in distribution of refractive errors. Fewer cased were seen in age group 11 and 12 years. Almost 86% of the subject achieved visual acuity of 6/6 in both eyes after correction.

Conclusion: myopia is a most prevalent form of ametropia in teenage groups. There is a need of creating awareness regarding its risk factors and life style modifications which can help in reducing burden of visual impairment

MeSH Keywords: Refractive error, Visual acuity, Myopia, Hypermetropia. Astigmatism.

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1. Introduction

The optical system of eyes is an integrated and coordinated function of ocular structures. For proper functioning of visual system, refractive power and transparency of ocular structures like cornea, lens, aqueous humor and vitreous is important in focusing the light on retina. All these structures form the optical system of an eye. When the parallel light rays are focused on the inner most layer of eye called retina the condition is emmetropia. This term is used for perfect vision. . In ammetropia light rays are not focused on the retina resulting in blurring of vision. Globally, refractive errors have acquired the status of a public health challenge. World health organization (WHO) states that refractive error is one of the prime cause of reduce vision which is approximately 43%. Refractive errors can affect all age groups, hence influencing the quality of life. Current evidence suggests that impaired vision is directly related to quality of life which is defined as physical, social and emotional well being. There is also a link of visual impairment with performance of daily visual tasks and visual functions. It has been found that uncorrected refractive errors have profound effect on mental health of young children ranging from increased anxiety, difficulties in reading, anti-social behavior and problems with self-esteem. This is an alarming situation as visual impairment due to refractive errors is preventable condition and its treatment is also cost effective in the form of spectacles. Global data shows that there is wide variation in effective refractive error coverage with some regions like South Asia having particularly low coverage. Broadly refractive errors are classified in three major categories. The myopia is most common type of refractive error followed by far-sightedness (Hyperopia), astigmatism, and Presbyopia. In myopia distant object appear blur, far-sightedness and Presbyopia result in near object being unclear. In astigmatism distorted image of target is formed. Uncorrected refractive errors may cause double diplopia, asthenopia and, headaches. Uncorrected refractive errors can have both short-term and long-term impacts in adolescent and adults life styles leading to decrease in learning abilities in studies and job opportunities resulting in comprised standard of life. It also influences a child's social behavior and comprehension abilities This signifies need for timely diagnosis and management of visual impairment and device methods to prevent irreversible visual incapacitation.

The pathophysiology of refractive errors is either increase in length of the eyeball resulting in myopia, shortening of eyeball causing hypermetropia.

Astigmatism is due to difference in curvature of cornea, retina or lens. Presbyopia is a age related change in lens . The occurrence of ametropia is significantly affected by genetic and environmental agents. Past research on refractive errors showed greater impact of genetic factors. Apart from this, factors like life styles, dietary habits. Visual requirements and metropoltanization play important in pathogenesis of refractive errors. Various .studies suggested myopic children regular diet is rich in carbohydrate with low consumption of fat and protein. Current fast paced environmental dynamics are most prevalent in establishing the pattern of myopia. Demographic pattern of region also exert influence on refractive error prevelance.

Myopia is one of the most prevalent eye disorders in all age groups. The reason of increase in trend of myopia especially in children is spending more time in academic activities and use of electronic devices. High myopia can cause significant eye related disorders which include irreversible loss of vision, dense cataract, retinal detachment glaucoma and maculopathy. Study has shown that between 1990 and 2017 the number of eye diseases in Pakistan has shown rising trend in all age groups and gender. This trend of steady increase is also expected by 2025.

. Keeping in view the number of cases of uncorrected ametropia in Pakistan and its impact on performances of young, the aim of this study is to determine the frequency of various type refractive errors in children aged 11-19 years of age visiting the Shaikh Zayed Hospital Lahore, Pakistan.

2. Materials & Methods

The study was conducted after approval from institutional ethical review board of Shaikh Zayed Post Graduate Medical Complex from 14-9-2023 to 14-02-24. Inclusion criteria for our study were age between 11-19 years and absence of congenital anomalies. Exclusion criteria were ocular trauma, intraocular surgery, cataract, squint, retinal pathology and ocular allergies.We estimated the sample size from WHO calculator. Assuming anticipated population proportion of 50%, with 95% confidence level and 5% margin of error require 384 participants while with 4% margin of error require 600 participants. Keeping in view study resources the sample size was taken as 500 participants. Participants were enrolled from the outpatient department of Shaikh Zayed Post Graduate Medical Complex ophthalmology department through consecutive sampling. For all the enrolled subjects, informed consent was taken from either the parent or the guardian.

All participants underwent detailed ocular examination. Subjective and objective vision was assessed. For distant Visual acuity measurement Snellen chart was used the participants with visual acuity of less than 6/6 in either eye underwent the pinhole test for each eye for any improvement in the visual acuity. The improvement of visual acuity by pinhole test means that the participant is having refractive error. All those having a visual acuity of less than 6/6 underwent refraction by auto refractometer and then subjective refraction. The participants were examined by an ophthalmologist using slit lamp to rule out any ocular pathology.

Data was entered and analyzed on SPSS version 22. Descriptive statistics included frequency and percentage for the study variables. Chi square test was used to compare gender wise distribution of types of refractive errors. We used two sided hypothesis, 95% confidence level for statistical significance. P value $\leq .05$ was taken as significant.

3. Results

Total 501 cases of refractive error were seen in the study period. Out of these female were slightly more 287 (57.3 %) and males were 214 (42.7%). Figure1.

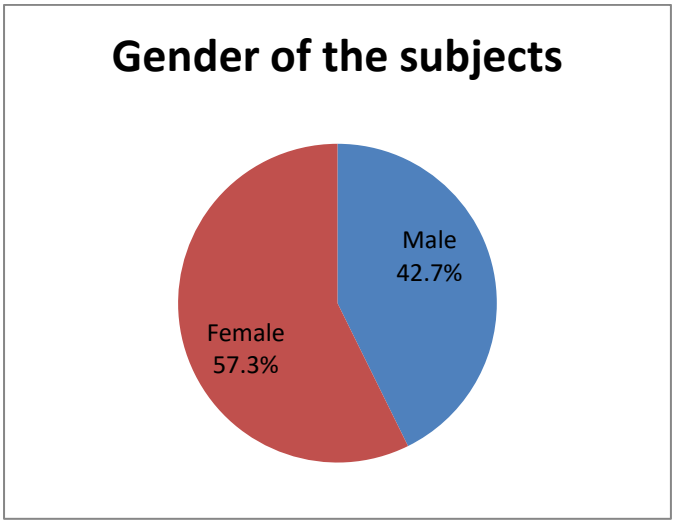

Figure 1: Gender wise distribution of the study participants

Median age of the study population was 16 (range11 to 19) years. There were infrequent cases of refractive errors in 11 and 12 years, total of 8 cases (2.6%) were seen in both age groups. 82 (16.4%) of the cases were seen in age group of 13 year and all subsequent years have similar percentage of cases. Table1

Table1: Distribution of age and refractive errors among study population

Age (in years)	Count	Astigmatism	Hyperopia	Myopia
11	6 (1.1%)	0	1(7.14)	4(1.80)
12	7 (1.4%)	2 (1.35)	1(7.14)	4(1.80)
13	2 (16.4%)	30 (20.27)	5(35.71)	47(13.86)
14	6 (15.2%)	22 (14.86)	3(21.42)	51 (15.04)
15	3 (14.6%)	19(12.83)	2(14.28)	52(15.33)
16	1 (14.2%)	23 (15.54)	1 (7.14)	47(13.86)
17	7 (13.4%)	21(14.18)	1(7.14)	45(13.27)
18	7 (13.4%)	20(13.51)	0	47(13.86)
19	52(10.4%)	11(7.43)	0	41(12.09)
Total	501	148	14	339

Myopia was most observed refractive error, 339 (67.7%) participants had myopia followed by astigmatism 148 (29.5%). Hyperopia was seen in small number of study participants 14 (2.8%). Figure 2

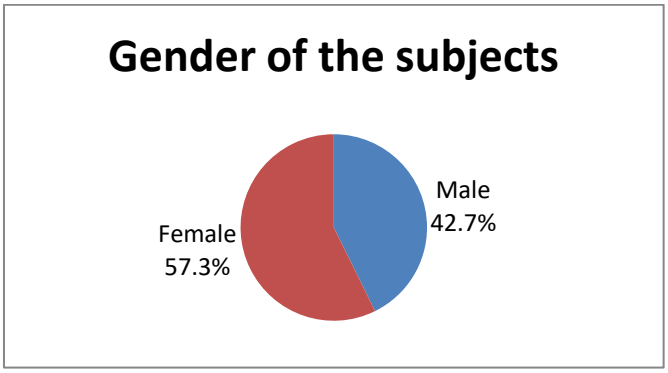

Figure 2: Refractive errors found in the study population

Among the total 148 (29.6%) astigmatism cases, most common findings was myopic astigmatism 110 (74.3%) followed by astigmatism alone is 37(25%) **Figure 3**

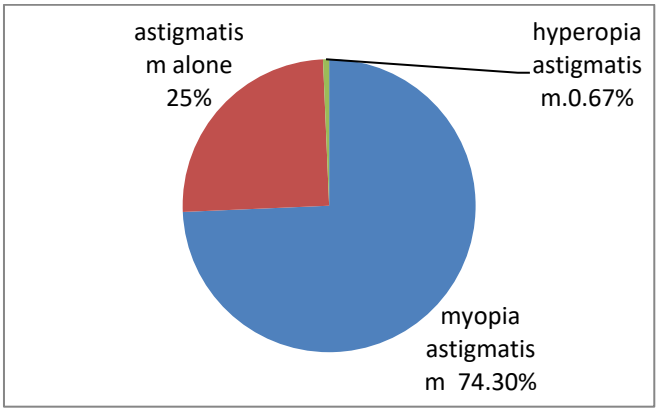

Figure 3: Type of astigmatism n=148

The result showed no significant difference in distribution of the refractive error among male and female participants. P value 0.971. **Table 2**

Table 2: Distribution of refractive errors according to gender

variable	Number	Refractive errors			P value
		Myopia	Hypermetropia	Astigmatism	
Gender					0.971
Female	287	193 67.2%	8 2.8%	86 30%	
Male	214	146 68.33%	6 2.8%	62 29%	

Best corrected visual acuity of 6/6 was seen in majority of the patients for right eye 435 (86.8%) and for left eye 434 (86.6%). The result showed that around 15% of the participant which is one in every 6th refractive error case the best visual acuity after correction is below 6/6. Table 3.

Table 3: Visual acuity after correction

Visual acuity	Right Eye	Left Eye
6/6	435 (86.8%)	434 (86.6 %)
6/9	48 (9.6%)	46 (9.2 %)
6/12	11 (2.2%)	17 (3.4 %)
6/18	2 (0.4%)	4 (0.8 %)
6/24	3 (0.6%)	-
6/60	1 (0.2%)	-

4. Discussion

Uncorrected refractive errors have profound impact on psychological, physical and intellectual development of young children. Due to its importance and short and long term impact, many studies have been done to determine its prevalence, epidemiology and associated risk factors. While considering the occurrence of ametropia, we must take into account that the prevalence's differ from one racial, geographical or occupational group to another. Other aspects such as types of study populations, evaluation of ametropia with or without medicine (cycloplen), participant age and ethnic differences are behind these variations. According to one study the prevalence of uncorrected refractive errors in Pakistan is 23.97% and 20% in males and females respectively.

This cross sectional was aimed for assessment of prevalence of refractive error in teenage population. Total 501 teenagers of both gender having uncorrected refractive errors were included in the study. In our study

Myopia was found to be most common type of refractive error (67.7%) followed by astigmatism (29.5%) and hyperopia (2.8%). The results were consistent with previous study conducted in public school of Lahore in 2019 in which myopia was (52%) followed by astigmatism (38.1%) and hypermetropia (9.8%) . In our findings, myopia and refractive errors were more prevalent in age group 13-19 years of age. Fewer cases were reported in age group 11 and 13 years. Study conducted in Colombia showed similar trend of increasing myopia with age and decrease prevalence of hypermetropia in children and adolescents. Such reverse trends were observed in adult population (35-55 years)

Asia is the world's most populous continent. In region of East Asia the prevalence of myopia is considerably greater than other region which is approximately 56.9%. According to a study conducted in 2013, the prevalence of myopia in 12 and 17 years old in East Asia was found to be 52.5% and 59.1% respectively. It was significantly higher when compared to European teenagers (8.6% and 17.7%). A study in Singapore showed that the frequency of myopia was 63.4% in teenage group. In Seoul, South Korea, the prevalence of myopia was 96.5% in males of age of 19 years, with 10% to 20% having high myopic refractive error .

High prevalence of myopia is also shown in various studies done in various countries. Study conducted in teenage and adult population of France showed that reported myopia progression rate was 18.2% and 13.9% in 14-15 and 16-17 age groups respectively . To know myopia etiology and formulate possible measures for its prevention, researches are done to identify its risk factors. At present the development and progression of myopia is still not well understood. Genetic, environmental and life style factors are associated with early onset of myopia . As far as environmental factors are concerned more time spent on studying is major risk factor. Many studies results concluded that increase duration of near work with shorter working distance increase the risk for myopia. Similarly myopia progression is reduce with more time spent outdoor . Myopia in parents is also recognizable factor in development of myopia Study conducted in China showed that there is increased prevalence of myopia in urban population than rural population10

Our study showed high prevalence of astigmatism 29.5%. Study conduction on adolescence in Mexico showed similar trend of high astigmatism which was approximately 29.17% .

As the prevalence of astigmatism varies with the ethnicity and race, studies in different countries showed different prevalence rates. The research carried out in China showed that the prevalence of astigmatism was 14% for 1.5 D or greater and 2% for 3.0 D or greater. The study conducted in school children aged 13-18 years of South African High School showed that the overall prevalence of clinically significant astigmatism (≤ -0.75 cylinder) was 3.1% which is very low .

A study conducted in tertiary hospital showed near sightedness was most eminent type of ammetropia in males in age group of 11-40 years while hypermetropia was seen in young age group (4-10 years) and older persons (> 41 years) . This is in contrast to our study in which astigmatism was more common than hypermetropia. As the etiology of astigmatism is unclear, high astigmatism in our study could be due to high prevalence of myopia in our study population. Some of the identified risk factors for astigmatism are young age, smoking during pregnancy, eyelid flap and early exposure to screen .

Prevalence of hyperopia decreases with increase in age. Our study showed overall low prevalence of hyperopia 14(2.8%). In contrast to our finding cross sectional study done in age group 0-30 years in Yemen population suggested that predominant refractive error was hyperopia (53.3%) followed by myopia (33.3%) and astigmatism was commonly associated with hyperioa and myopia . In our study about 86% of the participants achieved visual acuity of 6/6 in both eyes after correction. It shows the significance of correction of refractive errors which will help in improving their performance. The subjects were from general population of Lahore reporting to our hospital due to ocular problems. These results cannot be applied to diverse community of Lahore. Moreover, as majority of teenage children attend the school, there is also need for evaluation of their performance after the correction of refractive errors.

5. Conclusion

Uncorrected refractive errors are globally considered as a public health problem. With simple and economical measure of prescribing glasses not only corrects the refractive errors, but also helps in improving learning abilities and confidence of children. With high prevalence of myopia, public awareness regarding its risk factor should be done at school and community

levels. There is dire need for increase in outdoor facilities and limited use of electronic devices in young generation so impending epidemic of myopia could be addressed in Pakistan. There is also need for regular and periodic eye examinations at school level so the children could be referred to proper health care facility. School and community-based programs can be further enhanced with free provision of glasses relieving the economical burden on poor families..

INSTITUTIONAL REVIEW BOARD

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Contributions:
A.M.A - Conception of study
Z.A - Experimentation/Study Conduction
I.A - Analysis/Interpretation/Discussion
S.R - Manuscript Writing
A.Q, T.I - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

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