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ORIGINAL ARTICLE

Frequency of Hyperopia in Children between 5 to 15 Years of Age

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ABSTRACT

Aim: To determine the frequency of hyperopia in children between 5 and 15 years of age.
Study Design: Cross sectional study
Setting and Duration of Study: Al-Shifa Trust Eye Hospital Rawalpindi between March 2015 to September 2015
Methodology: 150 children between the ages of 5-15 years were included in the study. All children with eye disorders like corneal opacity, retinoblastoma, cataracts, amblyopia, chronic metabolic disorders, and hemoglobinopathies were excluded from the study. The participants were assessed for visual acuity was checked through a LogMAR visual acuity assessment chart for each eye. Those who found to have decreased visual acuity their pin-hole visual acuity was determined and then they got thorough examination by slit lamp biomicroscopy and fundoscopy to rule out causes of decreased vision other than refractive errors.
Results: A mean (SD) age of 8.57 (2.52) years with 106 (70.76%) children between 5-10 years and 44 (29.33%) were between 11-15 years of age. Males were predominant in our study with 90/150 (60%) male patients and 60 (40%) female population. The frequency of hyperopia I our study was 93 (62%). Out of 60 female patients, 35 (58.33%) had hyperopia whereas, out of the 90 male patients, 58 (64.4%) patients had hyperopia.
Conclusion: We reported that hyperopia is a very frequent refractive disorder found in children. Male are more frequently diagnosed with the disorder between the ages of 5-10 years. Further large-scale cohorts should be conducted to determine the correlating factors that increase the risk of hyperopia and prognosis.
Keywords: *hyperopia, refractive disorders, strabismus, emmetropia, ocular examination, visual acuity*

INTRODUCTION

Hyperopia is one of the most frequently occurring refractive errors in young children[1-2].

The refractive state depends on the power of the lens and corneal power, the anterior chamber depth, and the axial length[1]. According to the World Health Organization, the most common cause of visual impairment and the second most common cause of visual loss, globally. The prevalence of visual impairment caused by refractive errors is as high as 43%[2].

Furthermore, an estimated 13 million children between the ages of 5 to 15 years, are suffering from uncorrected refractive errors and are visually impaired.[3] In Pakistan, 11.4% people with visual loss are suffering from uncorrected refractive error[4].

In a recent metaanalysis published in 2014, where forty studies were analyzed, it was reported that the incidence of hyperopia decreased with increasing age with a prevalence of hyperopia between 8.4% at age 6, 2-3% at age between 9 -14 years and only 1 percent by the age of 15 years.[5] It was also revealed that hyperopia was more frequent in children who lived in rural areas compared to urban residents.[5] However, the analysis was not consistent about the association between hyperopia and sex, family income and parental education. Other recent studies reinforced these findings[6-8].

It is important to identify the factors associated with increased risk of hyperopia and other refractive errors among young children. Assessment by experienced pediatric ophthalmologist is necessary to establish diagnosis hence, providing timely corrective procedure[7]. A recent study by Jiang et al, in 2019 concluded that maternal smoking status during pregnancy and a positive family history of refractive disorders were associated with a increased risk of hyperopia ($P < 0.05$).[8] Ethnicities and race has also been indicated to have an impact on the incidence of the disease[5,8].

Hyperopia can lead to anisometropic amblyopia and strabismus in children. So that early detection and management of hyperopia can prevent blindness in children. Unfortunately, there is limited data on the frequency of hyperopia in children and associated clinical and demographic profile of young children from Pakistan, hence the present study was conducted.

The main purpose of this study was to find out the frequency of hyperopia in children between 5 to 15 years of age so that we can manage this refractive error at an early stage to avoid ocular problems like amblyopia and strabismus.

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METHODOLOGY

A cross-sectional observational study was conducted at Alshifa Trust Eye Hospital Rawalpindi between March 2015 to September 2015 for a duration of 6 months after obtaining ethical approval from the institutional review board of Alshifa Trust Eye Hospital. The sample size of 150 was obtained using the WHO sample size calculator, keeping the confidence interval of 95%, and the prevalence of hyperopia of 8%.[5] Children between the ages of 5 and 15 years were enrolled in the study using the non-probability consecutive sampling. All children with a history of progressive vision impairment for the past year were included in the study. Children with eye disorders like corneal opacity, retinoblastoma, cataracts, amblyopia, chronic metabolic disorders, and hemoglobinopathies were excluded from the study. Informed verbal and written consent from the child's legal guardian were procured prior to the child's enrollment in the study. Data about socio-demographic variables like age, gender, residence, parental education, income of the household, and child's body mass index were recorded in a preformed electronic form along with clinical variables like presenting signs and symptoms. Hyperopia was diagnosed based on eye examination where children with spherical equivalent of +0.50 diopters or greater established the diagnosis of hyperopia. Below is the brief details of the eye examination performed on participants.

1. Visual acuity (VA) was observed and recorded at 4 meters using ETDRS log MAR charts.
2. The external eye examination was conducted using the slit-lamp examination for any pathology.
3. Administration of proparacaine (0.5%) and 2 drops of

cyclopentolate (1%) was done for both eyes to determine the refractive errors.

4. Cycloplegic refraction (a procedure where patient's eyes are temporarily paralyzed to determine the refractive error) was performed with an autorefractometer, which was performed by an experienced retinoscopist who was blinded to the objective of the study.
5. The estimated refractive error was confirmed by Post Mydriatic Testing (PMT) by subjective refinement.

Data analysis: All variables were converted to excel sheets and entered into SPSS version 26. The continuous variables such as mean age and the mean BMI of children were presented as mean and standard deviation. For categorical variables like gender, incidence of hyperopia, education, smoking status of mother during pregnancy were all illustrated in graphical or tabular forms in frequency and percentages.

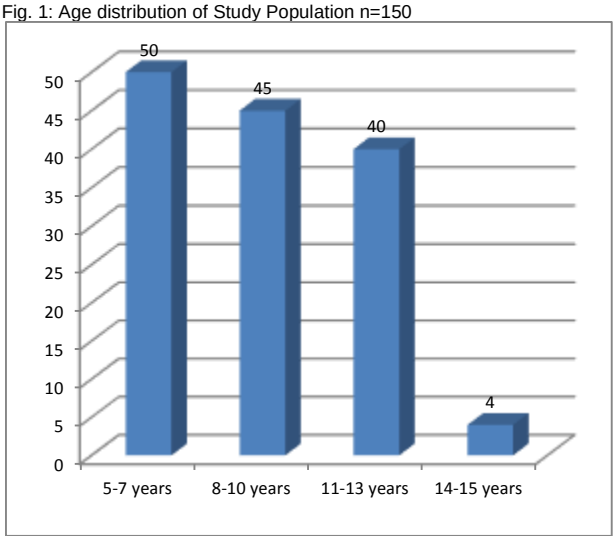
RESULTS

A total of 150 children between the age of 5-15 were included in the study, with a mean (SD) age of 8.57(2.52%) years. 106(70.76%) children were between 5 to 10 years of age and 44 (29.33%) were between 11 to 15 years of age. Males were predominant in our study with 90/150 (60%) male patients and 60 (40%) female population. See table 1 and figure 1.

Table 1. Demographic characteristics of study population (n=150)

Age group 05-10 years 11- 15 years	 106 (70.67%) 44 (29.33%)
Gender Male Female	 90 (60.0%) 60 (40.0%)
Refractive Status Normal Hyperopia	57 (38.0%) 93 (62.0%)
Maternal Smoking status during pregnancy Yes No	 10 (6.67%) 140 (93.33%)
Parental Education No formal education Up to Highschool College or Higher	25 (16.67%) 68 (45.33%) 57 (38.00%)
Residence Rural Urban	121 (80.67%) 29 (19.33%)

Fig. 1: Age distribution of Study Population n=150



The frequency of hyperopia I our study was 93 (62%). Out of 60 female patients, 35 (58.33%) had hyperopia whereas, out of the 90 male patients, 58 (64.4%) patients had hyperopia.

DISCUSSION

The frequency of hyperopia in our study was 93(62%). Furthermore, we reported a higher male frequency with hyperopia in our study compared to female population with a mean age of 8.57 years and a range between 5-15 years. In a study from the Agency hospital Landikotal, the authors revealed comparable frequency of hyperopia of 58 percent. However, the age of children in their study was between 1-15 years.[9] Hence, the present study reported a higher frequency of hyperopia.

A study on prevalence of hyperopia done in Southern Brazil showed increased prevalence of hyperopia between 5 to 11 years of age which is consistent our study.[10] In our study 106 children out of 150 children were between 5 to 10 years of age and 78 (73.6 %)of them were hyperopic.

In our study 60% were males and 40% were females the reason is that our society is male dominant and female population in Pakistan does not have very easy access to healthcare in our society. The finding was different from the multi-center survey of refractive error defects from China, Chile, and Nepal where hyperopia was significantly higher in female patients[11,12]. In another study conducted in Eye Unit Lady Reading Hospital Peshawar shah also found that 56% were male and 44 %were female[13].

We found that the majority of the patients in our study belonged to urban region. In a study from Nepal addressing the patterns of refractive errors in school going children it was reported that prevalence of hyperopia was higher in urban students compared to the rural areas[14].

Our findings slightly differ from the studies previously conducted because there is a huge sociodemographic difference between developed and developing countries like Pakistan. People have awareness in developed countries of world and they prefer ocular examination of their children properly by ophthalmologists and do proper follow ups .There is no sex discrimination while in underdeveloped countries there is no much awareness regarding vision problems in children. There are a lot of financial problems similarly most of the female children do not have access to education, proper healthcare, consume less nutritious food as compared to their male counterparts. Therefore, it is very difficult to compare the results of refractive error studies from developed countries with poor-income countries.

In one local study, conducted in Lahore, the refractive error was more prevalent in male patients who played video games frequently. This could be because of the strain video playing puts on eyes.[15] However, further studies would have to be conducted to ascertain these claims.

Compliance with glasses was much better in children belonging to educated families and most of them already using glasses. The frequency of hyperopia decreased with increasing age. Similar findings were reported in a meta-analysis where significant association was found between younger age and incidence of hyperopia[5].

In short, we concluded that hyperopia is a very frequent refractive disorder in children in Rawalpindi, Pakistan. Male are more frequently diagnosed with the disorder between the age of 5-10 years. Further large-scale cohorts should be conducted to determine the correlating factors that increase the risk of hyperopia and prognosis.

Despite many strengthening points of the study, there are some weaknesses. The present study was hospital-based; therefore, it raises the question of generalizability of the findings. Another factor which was a hindrance in our study was age of children. Small children usually afraid of hospital setting. They are shy and do not allow for examination. It took time to make these children comfortable in a hospital environment for proper ocular examination.

CONCLUSION

We reported that hyperopia is a very frequent refractive disorder found in children. Male are more frequently diagnosed with the disorder between the age of 5-10 years. Further large-scale cohorts should be conducted to determine the correlating factors that increase the risk of hyperopia and prognosis.

Conflict of interest: Nil

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