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Frequency of Uncorrected Refractive Errors in Children age group 5-15 years in hospital population of Punjab

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Author`s Contribution

MZ Conception and design, MT,WJ Collection and assembly of data, SH,MM Analysis and interpretation of the data, Statistical expertise, KM,MZ Final approval and guarantor of the article

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A B S T R A C T

Background: Uncorrected refractive errors (UREs) are a major cause of preventable vision impairment in children, affecting learning and daily activities. If untreated, they can lead to amblyopia, low vision, and long-term visual disability. Early detection and correction are critical to reducing the burden of childhood blindness, especially in underserved regions like Punjab, Pakistan.

Objective: The aim of this study was to regulate frequency of uncorrected refractive errors in children age group of 5-15 years

Methodology: It was a hospital based cross-sectional study. A properly designed and approved pre tested Pro-forma was used for data collection. Data was collected from eye OPD of Benazir Bhutto Hospital, Rawalpindi and Nishtar Hospital, Multan.

Results: This study was conducted on 400 children age from 5-15 Years who were attending Eye OPD. Among the subjects 62.6% were males and 36.9% were females. Age distribution 32.4%(N=130) subject had age 5-10 years and 67.3%(N=270) had age 10-15 years. Distribution of refractive errors there were 53.6%(N=215) myopia,24.2%(N=97) hyperopia and 21.9%(N=88) astigmatism. Distribution of astigmatic errors there were 1.5%(N=6) simple myopic astigmatism and 1.8%(N=7) were simple hypermetropic astigmatism and 10.3%9(N=41) were compound myopic and 5.3%(N=21) compound hyperopic and 2.5%(N=10) mixed astigmatism.

Conclusion: Concluded that frequency of refractive errors in children (5-15) was at high risk. Uncorrected refractive errors lead to amblyopia, diseases and low vision. We have to correct refractive errors to avoid amblyopia and low vision.

Keywords: Refractive Error, Myopia, Hyperopia, Astigmatism, Pediatric refractive error

Introduction

Refractive errors are a type of vision problem that makes it difficult to see clearly. They happen when the eyes do not focus light correctly on retina. Uncorrected refractive errors are leading cause of low vision and can lead to blindness.[1] The initiative to eliminate avoidable blindness worldwide has given high priority to correction of refractive error and reduce the chances of childhood blindness.[2] Blindness due to RE usually obvious at an early age. A few of these children compensate for these errors utilizing the accommodative power of the eye but steadily exceed with age.[3] In others, the refractive errors are so high that they cause problem in learning and daily activities .[4] Hence, it is critical that children with refractive errors are observed and given treatment in early age.[5]

There are three type of refractive errors which are myopia, hypermetropia and astigmatism.[6] Myopia is a condition in which the images come to focus in front of the retina of the eye resulting defective vision especially of distant objects.[7] So much attention is paid to myopia worldwide due to this prime reason. Myopia is highly prevalent among children and tends to progress over time. Even mild uncorrected myopia can significantly impair visual acuity, while high myopia substantially increases the risk of serious eye conditions. Recent studies suggest a rising global incidence of myopia, with evidence pointing to both genetic and environmental factors as key contributors.[8] There is low prevalence of myopia of children having age more than 6 and incidence of myopia increases after 6 years of age. Young children typically exhibit mild

hyperopia, the most common refractive error in early childhood. However, myopia is clinically defined as -0.50 D or worse, marking a distinct phase in refractive development for those predisposed to the condition. While myopia often stabilizes in late adolescence, progression tends to slow over time, with many cases ceasing before age 20.[9]

However, some individuals particularly those engaged in extensive near work (such as students) or with higher initial myopia may experience continued progression into adulthood. Regular refractive assessments and timely intervention are crucial for these patients to manage ongoing progression. Without proper monitoring, persistent myopia can lead to severe cases, significantly increasing the risk of vision-threatening complications.[10]

Hypermetropia is a condition in which images come to focus behind the retina of the eye while accommodation is being at rest while vision is better for distant than for near objects. From birth, The eyes keep growing, and their refractive state normally changes over time, gradually shifting from hyperopia to emmetropia.[11] During the first six months, most newborns have slightly farsighted vision (hyperopia) when measured with cycloplegia, with an average refractive error of about +2.00 D (± 2.75 D). This range follows a normal distribution in infants.[12] Refractive errors will reduce slowly such that, by 5 to 7 years of age, most children will have hyperopia.[13] This condition is linked to reading problems, learning difficulties, lower cognitive abilities, and delayed development of visual perception in children. Since children have strong focusing ability (high accommodation) and can't reliably describe their vision, cycloplegic refraction (using eye drops to relax the eye's focus) is needed for accurate testin.[14] Treatment works by using a convex lens to properly focus light onto the retina. Astigmatism is a condition in which light rays coming from infinity focus on different focal point. This condition frame is due to asymmetric refraction of light beams through cornea or crystalline lens and causes blurry vision.[15]

Astigmatism is an optical condition in which light rays not meet to a common focus due to imperfection of the curvature of the optical part of human eye such as cornea and crystalline lens which results in deformed images. Normally cornea and lens are smooth and curved equally in all direction and formed a point focus on the back of eye such as retina but when the patient's cornea and lens not in proper form and curve than rays not refracted on the point focus at retina but form two or more focal points at retina, in front and behind the retina. As babies grow between 6 to 12 months old, their eyes naturally become less farsighted (a process called emmetropization). Most newborns start with similar levels of farsightedness, but this typically decreases with normal eye development. However, in communities where access to education and eye care is limited, people often remain at this level of farsightedness throughout their teens and adulthood.[16]

Materials and Methods

We conducted a cross-sectional study at two major hospitals in Punjab, Pakistan: Benazir Bhutto Hospital in Rawalpindi and Nishtar Hospital in Multan. The study focused on children between 5 and 15 years of age who visited the eye outpatient departments. To select participants, we used a combination of convenient and purposive sampling techniques, enrolling a total of 400 patients over a six-month period from March to August.

Data collection was carried out using a pre-approved questionnaire (proforma), and all measurements were taken with standard ophthalmic instruments, including Snellen's visual acuity chart, retinoscope, trial box, cyclopentolate drops, and an auto refractometer. The inclusion criteria required children to be within the specified age range (5–15 years) and have uncorrected refractive errors. After gathering the necessary information, we analyzed the data using SPSS software to determine the prevalence and distribution of refractive errors in this pediatric population.

This approach ensured a systematic evaluation of uncorrected refractive errors while maintaining practical feasibility in a hospital-based setting.

Results

Current study was conducted on 400 children age with 5-15 Year who were attending Eye OPD. Out of which 63.1% were males and 36.9% females (Figure 1).

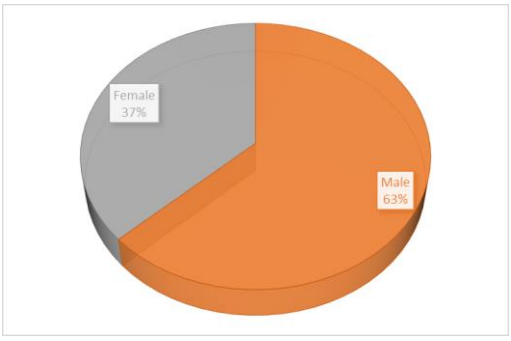

Figure I. Gender based distribution of study participants

Regarding age distribution 130 (32.4%) subject have age 5_10 years and 67.6 %(N=270) have age 10_15 years. Distribution of myopic out of 215 there were male 55%(N=138) and female 51.4%(N=76). Distribution of hypermetropies out of 97 there were males 22.3%(N=56) and females 25%(N=37). Distribution

of astigmatism out of 88 there were 22.7%(N=57) were males and 23.6%(N=35) females.

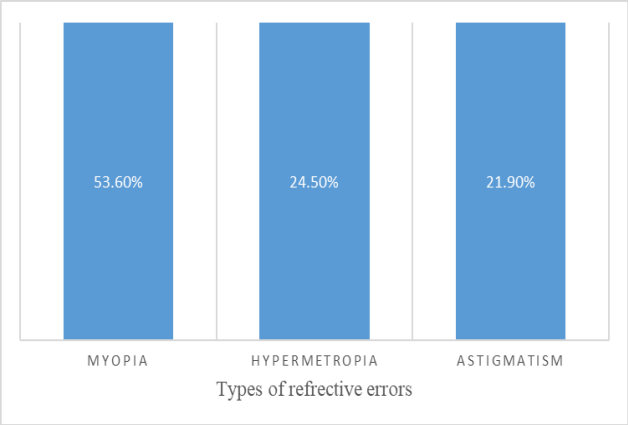

Figure 2. Percentage of Refractive Error in study participants.

Figure 2 showed there were 53.75%(N=215) myopes, 24.25%(N=97) hyperopes and 22%(N=88) astigmatism. Distribution of astigmatic error there were 1.5%(N=6) simple myopic astigmatism and 1.8%(N=7) were simple hypermetropic astigmatism and 10.2%(N=41) were compound myopic and 5.7%(N=21) compound hyperopic and 2.8%(N=10) mixed astigmatism

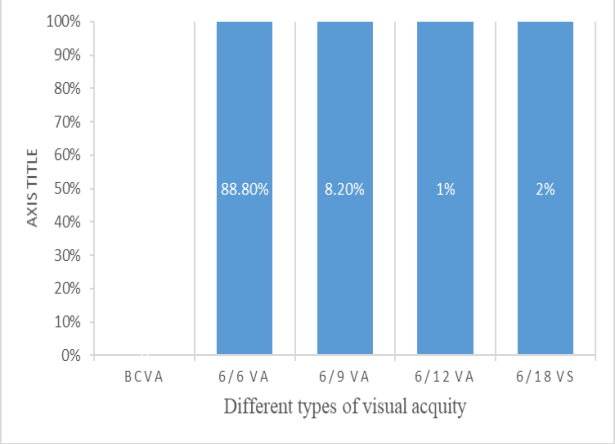

Figure 3. Visual acuity among individuals of study.

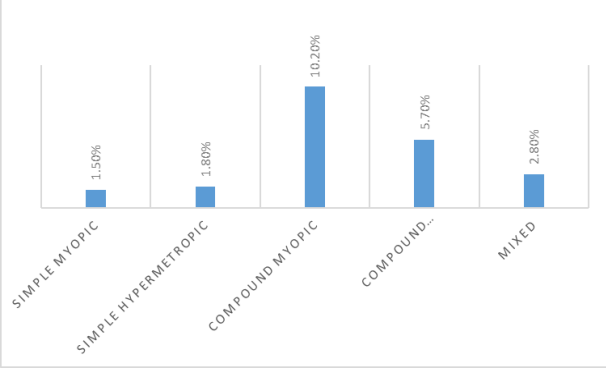

Figure 4. Types of Astigmatism among individuals.

In refractive error subjects (Figure 3**)** in right eye, 88.8 % (360 out of 400) subjects had BCVA were 6/6, 8.2 % (33 out of 400) subjects BCVA were 6/9, 1.5 % (6 out of 400) subjects BCVA were 6/12, 0.25 % (1 out of 400) subjects BCVA were 6/18. Types of Astigmatism among individuals is depicted in figure 4.

Discussion

This study aimed to determine the frequency of uncorrected refractive errors among children aged 5–15 years in the hospital population of Punjab, Pakistan. The findings reveal a high prevalence of refractive errors, with myopia being the most common (53.6%), followed by hyperopia (24.2%) and astigmatism (21.9%). These results are consistent with previous studies conducted in similar settings and age groups, both within Pakistan and in other regions, highlighting the significant burden of uncorrected refractive errors in pediatric populations.

The high prevalence of myopia observed in this study (53.6%) aligns with findings from other hospital-based studies in Pakistan. For instance, a study conducted in Bahawalpur reported myopia in 65.57% of children with refractive errors, while another study in Lahore found myopia in 61.7% of affected children. Similarly, a study from Faisalabad indicated that myopia was the most prevalent refractive error among school-aged children.[17] These consistent findings suggest that myopia is a major public health concern in Pakistani children, possibly influenced by genetic, environmental, and lifestyle factors.

Hyperopia was the second most common refractive error in our study (24.2%), which is higher than the rates reported in some regional studies (e.g., 6.55% in Bahawalpur, 14% in Lahore. This discrepancy may be attributed to differences in sample characteristics, diagnostic criteria, or measurement methods. Astigmatism was found in 21.9% of children, which is comparable to rates reported in Bahawalpur (27.86%) and Lahore (24.3%).[18]

Age-wise distribution showed that the majority of children with refractive errors were in the 10–15 years age group (67.6%), compared to 32.4% in the 5–10 years group. This trend is consistent with the natural history of refractive errors, where myopia often develops or progresses during school years due to increase near-work activities and physiological changes. Furthermore, a positive family history of refractive errors was reported in 67.6% of cases, underscoring the role of genetic predisposition in the development of refractive errors.[19]

The results also emphasize the clinical and public health implications of uncorrected refractive errors, including the risk of amblyopia, learning difficulties, and reduced quality of life. The high percentage of children achieving 6/6 vision with correction

(88.8% in the right eye and 88.3% in the left eye) highlights the effectiveness of optical correction and the importance of early detection and intervention.

However, this study has several limitations. The hospital-based design and convenient sampling method may limit the generalizability of the findings to the broader population. Communication barriers and time constraints may have also affected data quality. Additionally, the study was conducted in only two tertiary care hospitals, which may not represent the situation in primary or secondary care settings or in rural areas.

Despite these limitations, the study provides valuable insights into the frequency and types of refractive errors among children in Punjab, Pakistan. It reinforces the need for systematic vision screening programs in schools and communities, increased public awareness, and improved access to affordable eye care services. Future research should include population-based studies with larger sample sizes and standardized protocols to better understand the epidemiology and determinants of refractive errors in children.

Conclusions

The researcher concluded that frequency of refractive errors in children (5-15) was present among subjects. Subject with uncorrected refractive error is at high risk of amblyopia. Subject with refractive error associated with diseases is at higher risk of low vision and blindness, and no doubt it is worldwide general health problems in developing countries like Pakistan where there are no particular resources for public health, lack of health services and lack of awareness about health. Another major issue is lack of equipment's and eye staff in the hospital at primary, secondary and tertiary level hospitals of Pakistan. In this study I found that the frequency of myopia was 53.6% and hypermetropia was 24.2% and astigmatism was 21.9% at tertiary level hospital and myopia was more common and hypermetropia was 2nd more common.67.8% refractive error subject was coming with positive family history of refractive error.

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