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- **Ocular Anatomy Damage and Malignant Blood Disorders**
- **Corneal Endothelial Analysis After Vitrectomy**
- **Dry Eye and Stress Among Medical Students**
- **High Myopia Prevalence in Young Adults at a Tertiary Eye Hospital**
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Prevalence Of High Myopia In Young Adult Patients Presenting To A Tertiary Eye Hospital In Rawalpindi, Pakistan

Waleed Ahmad¹, Saud ul Hassan Memon², Mehwish Ameer², Yasir Ahmad¹

Abstract:

Objective: To determine how common high myopia is among the younger patients seen at a tertiary eye facility.

Methods: A descriptive Cross-Sectional study, carried out at the Department of Ophthalmology, Al-Shifa Trust Eye Hospital, Rawalpindi, from 1st June 2022 till 1st August 2022. Seventy participants aged 18 to 30 years old, were tested for refraction using nonprobability consecutive sampling and both automated and manual methods, if needed. Refractive error values reported in this study are based on Spherical Equivalent Refraction (SER), calculated using the formula: $SER = \text{Sphere} \pm \frac{1}{2} \text{Cylinder}$. This method was applied to ensure standardized measurement of refractive errors across all participants. Data were analyzed using SPSS Version 22.0.

Results: The study found that 42.9% of participants had a refractive error between -7.0 to -7.9 D, 40.0% had -6.0 to -6.9 D, and 17.1% had -8.0 D or higher. Females exhibited a slightly higher prevalence of severe myopia than males.

Conclusion: This study assessed the severity of high myopia among young adults attending a tertiary eye hospital in Rawalpindi. The findings revealed a significant portion of participants with severe refractive errors, particularly among females. These results highlight the need for early detection and tailored interventions to manage the high degree of myopia effectively, aiming to reduce the risk of complications and improve vision-related quality of life. *Al-Shifa Journal of Ophthalmology* 2024; 20(4): 157-162. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.

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Introduction:

Myopia is an escalating health concern. The World Health Organization reports that 30% of the global population is already myopic, and by 2050, this figure is projected to rise to 50%.^{1,2} The highest frequency of myopia is observed in East and Southeast Asian nations. Myopia, also known as nearsightedness, occurs due to a mismatch between the optical power of the eye and its axial length, often resulting from aberrant emmetropization. Axial elongation is a primary contributor in cases of axial myopia, but other optical factors can also play a role.³ In a non-accommodating myopic eye, light rays coming from an object at infinity converge too much and focus in front of the retina. It is common practice to classify myopia as either non-pathologic or pathologic. High myopia is typically defined as a spherical

equivalent refractive error of -6.0 diopters (D) or greater. Pathologic myopia, on the other hand, refers to a subset of myopia that is associated with structural changes in the retina, such as myopic maculopathy or choroidal neovascularization, which may occur even in cases of moderate myopia. This distinction is based on the classifications provided by the International Myopia Institute (IMI).⁴ Myopia diminishes vision-related quality of life and exacerbates challenges in executing vision-dependent tasks.⁵ The medical implications of extreme myopia encompass pathological consequences like myopic retinal degeneration, choroidal neovascularisation, cataracts, and glaucoma.⁶ Older people exhibit a heightened risk of myopia. Research indicates that elevated educational attainment, advancing age, extensive near labour, familial predisposition, and reduced engagement in outdoor activities are associated with an increased risk of myopia.⁸ Following the global COVID-19 pandemic, screen usage has escalated across all age demographics. A study conducted on Pakistani people over the age of 30 has revealed a prevalence of high myopia (RE < -6.0D) at 4.6%.¹⁰ Research on the frequency of high myopia in Pakistan is scarce. It is essential to assess the current severity of high myopia to evaluate its impact on visual quality of life in Pakistan. This study aims to evaluate the severity of high myopia among young adults attending a tertiary eye hospital in Rawalpindi, Pakistan, rather than determining its overall prevalence, considering the increasing global incidence of myopia, especially within Asian demographics, and the absence of local data. Comprehending this burden is essential for implementing early intervention methods and mitigating potential long-term problems that affect vision-related quality of life.

Methodology:

This cross-sectional study was conducted at Al Shifa Trust Eye Hospital, Rawalpindi from June 1, 2022, to August 1, 2022. The research was carried out at the Outpatient Department (OPD). Anon-probability consecutive sampling method was employed for participant selection. This method guaranteed that all patients fulfilling the inclusion criteria who visited the outpatient department throughout the study period were incorporated. Based on a previous study by Shaheen P Shah et al., which found a prevalence of high myopia of 4.6% in the adult population of Pakistan, the sample size was estimated using the WHO sample size calculator. At a 95% confidence level, with an expected population proportion of 0.046 and an absolute precision of 0.05, the determined sample size was 70 people. After the approval from the Hospital Ethical Committee was obtained, data collecting could begin. High myopia, defined as a Spherical Equivalent Refraction (SER) of -6.0 diopters (D) or more, was examined in patients diagnosed with the condition. The SER was calculated using the formula: $SER = \text{Sphere} \pm \frac{1}{2} \text{Cylinder}$. These patients ranged in age from 18 to 30 years. Subjects of either sex who were prepared to take part and who supplied written informed consent were considered for inclusion. Patients were excluded if they met any of the following criteria: age younger than 18 years or older than 30 years; a current or previous history of ocular injury or ocular surgery; the presence of systemic or ocular diseases known to affect refraction (e.g., diabetes, keratoconus); or inability or unwillingness to provide informed consent.

Before recruiting participants, we made sure they understood the study's goals and benefits and got their written informed consent. After undergoing a comprehensive eye examination, individuals who were deemed suitable were recruited from the eye outpatient department. The TOPCON Kerato-

Refractometer KR-800, which does not require cycloplegic testing, was consistently used for all participants to ensure uniform data collection. To minimize inter-observer variability, a single expert ophthalmologist conducted all refraction measurements. Manual retinoscopy and subjective refraction were not utilized, ensuring that the data remained consistent across all participants. Name, age, gender, address, and refractive defect were some of the vital pieces of information that were recorded using a standardized data collection form. With a refractive error of -6.0D or above defined as high myopia, the prevalence of this condition was the primary outcome measured.

Data were analyzed using SPSS version 22.0. Frequencies and percentages were calculated for categorical variables such as age, gender, and refractive error. Continuous variables were analyzed to determine the mean and standard deviation. Post-stratification involved the application of Chi-square tests to compare different groups, with a p-value of less than 0.05 considered statistically significant. The data were presented using tables and charts.

Results:

The average age of participants was 23.4 ± 2.9 years, indicating a relatively young group. The average refractive error in participants was -7.1 ± 0.6 diopters (D), reflecting the study's focus on individuals with high myopia. (Table 1). The age distribution indicated that the largest

proportions of participants were in the 21-23 years and 24-26 years age groups, accounting for 32.9% and 31.4% of the sample, respectively.

The gender distribution was balanced, comprising 50% male and 50% female participants. In the analysis of the severity of high myopia, 42.9% of participants exhibited a refractive error between -7.0 and -7.9 D, which was the most frequently observed range. This was followed by 40.0% with refractive errors ranging from -6.0 to -6.9 D, and 17.1% with refractive errors of -8.0 D or greater (Table 2).

The 18-20 years age group exhibited the highest prevalence of refractive error between -6.0 to -6.9 D at 58.3%, whereas the 27-30 years age group showed the lowest prevalence at 15.4%. The highest prevalence of severe myopia (-8.0 D and above) was observed in the 27-30 years age group, reaching 30.8%. The Chi-square test revealed no statistically significant differences in the distribution of high myopia across age groups (p-value = 0.24) (Table 3). In the male cohort, 45.7% exhibited a refractive error within the -6.0 to -6.9 D range, whereas 17.1% presented with a refractive error of -8.0 D or greater. Conversely, in the female participants, the predominant refractive error range was -7.0 to -7.9 D, impacting 48.6% of the female cohort, while 17.1% exhibited a refractive error of -8.0 D or greater. The Chi-square test indicated no statistically significant differences in the prevalence of high myopia between male and female participants (p-value = 0.71) (Table 4).

Table 1: Descriptive Statistics of Quantitative Variables (n=70)

Variable	Mean	Standard Deviation (SD)
Age (years)	23.4	2.9
Refractive Error (D)	-7.1	0.6

Table 2: Distribution of Qualitative Variables (n=70)

Age Groups		
Age Group (years)	Frequency (n)	Percentage (%)
18-20	12	17.1%
21-23	23	32.9%
24-26	22	31.4%
27-30	13	18.6%

Gender Distribution		
Gender	Frequency (n)	Percentage (%)
Male	35	50.0%
Female	35	50.0%

Prevalence of High Myopia		
Refractive Error (D)	Frequency (n)	Percentage (%)
-6.0 to -6.9 D	28	40.0%
-7.0 to -7.9 D	30	42.9%
-8.0 D and above	12	17.1%

Table 3: High Myopia Stratified by Age Group (n=70)

Age Group (years)	Refractive Error (D)	Frequency (n)	Percentage (%)	Chi-Square (χ^2)	p-value
18-20	-6.0 to -6.9 D	7	58.3%	6.71	0.24
	-7.0 to -7.9 D	4	33.3%		
	-8.0 D and above	1	8.3%		
21-23	-6.0 to -6.9 D	10	43.5%		
	-7.0 to -7.9 D	10	43.5%		
	-8.0 D and above	3	13.0%		
24-26	-6.0 to -6.9 D	9	40.9%		
	-7.0 to -7.9 D	9	40.9%		
	-8.0 D and above	4	18.2%		
27-30	-6.0 to -6.9 D	2	15.4%		
	-7.0 to -7.9 D	7	53.8%		
	-8.0 D and above	4	30.8%		

Table 4: Prevalence of High Myopia Stratified by Gender (n=70)

Gender	Refractive Error(D)	Frequency(n)	Percentage(%)	Chi-Square (χ^2)	p-value
Male	-6.0 to -6.9 D	16	45.7%	1.37	0.71
	-7.0 to -7.9 D	13	37.1%		
	-8.0 D and above	6	17.1%		
Female	-6.0 to -6.9 D	12	34.3%		
	-7.0 to -7.9 D	17	48.6%		
	-8.0 D and above	6	17.1%		

Discussion:

This study aimed to assess the severity of high myopia in young adults attending a tertiary eye hospital in Rawalpindi, Pakistan. The results indicated a mean refractive error of -7.1 D among participants. Although the data showed a slightly higher proportion of females with severe myopia (-7.0 to -7.9 D), this difference was not statistically significant (p -value > 0.05). These findings offer significant insights into the prevalence of excessive myopia among this group and correspond with recent global trends.

Numerous studies undertaken in the last five years have indicated analogous trends in the prevalence of high myopia, especially among Asian populations. A study in China including university students revealed a mean refractive error of -6.8 D, with females exhibiting a somewhat greater prevalence of severe myopia compared to males, consistent with our findings¹¹. A separate study conducted in South Korea indicated a mean refractive error of -7.2 D in young people, with a considerable segment of the population displaying high myopia¹². The findings align with the rising incidence of myopia observed in East and Southeast Asia, where lifestyle variables such as extended near employment and restricted outdoor activities are believed to contribute to the elevated prevalence of myopia¹³. Conversely, research in Western nations has indicated reduced prevalence rates of high myopia among young adults. A study in the United States indicated a mean refractive error of -5.5 D among young people, which is considerably lower than that seen in our research and others involving Asian populations¹. This disparity may be ascribed to differing genetic predispositions and environmental influences between Western and Asian people.¹⁵ Our study did not demonstrate statistically significant variations in the stratification of high myopia prevalence by age, while the 27-30 years age group exhibited a greater prevalence of severe

myopia (-8.0 D and above). This observation aligns with data from a search in Singapore, indicating that older young individuals exhibited greater degrees of myopia¹. This may result from the cumulative impact of sustained exposure to risk variables, such as continuous near work over time¹. Previous studies have found gender differences in myopia prevalence, with some indicating a higher incidence in females, especially for more severe cases of myopia¹. Our study observed a slightly higher frequency of severe myopia among female participants compared to males; however, this difference was not statistically significant (p -value > 0.05), and thus cannot be interpreted as a true gender difference in the severity of myopia. This may result from behavioral differences, including prolonged near work and reduced outdoor activities, which have been more commonly found in females¹. This study has some limitations that must be recognized. The sample size was limited, and the study was performed at a single tertiary care hospital, thereby restricting the generalizability of the results to the wider population. The cross-sectional form of the study precludes the evaluation of temporal variations in myopia prevalence or the determination of causative linkages. The study ultimately depended on non-cycloplegic refraction, which may not correctly represent the underlying refractive error, especially in younger individuals who may have residual accommodation².

Conclusion:

In conclusion, the incidence of high myopia among young people in Rawalpindi is analogous to that observed in other Asian populations, with a considerable percentage of persons displaying severe myopia. The marginally elevated prevalence in females and the tendency for greater severity in older young adults underscore the necessity for focused public health measures. These

findings emphasize the significance of early detection and management techniques to alleviate the long-term consequences linked to high myopia. Additional studies utilizing larger, more heterogeneous samples and longitudinal methodologies are essential to elucidate the underlying reasons and formulate viable preventative interventions.

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