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ORIGINAL ARTICLE

Axial Length Changes in Myopic Population in North West Pakistani Population

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Abstract

BACKGROUND: Refractive errors become apparent if lenses and cornea fail to adjust for axial length (AL) elongation (myopia) or reduction (hyperopia). Since axial length is the critical factor in both myopia and hypermetropia, it got the most attention among these.
Objective: to determine Axial length changes in myopic population in Northwest Pakistani population
Study design: Prospective longitudinal case series
METHODS: One hundred patients examined through informed consent attended the eye outpatient department DHQ Abbottabad ranging in age from 10-40 years. SPSS v 23 was used to calculate the results.
RESULTS: One hundred patients were examined through informed consent 49 were male, and 51 were female. The right eye's mean spherical error was -7.29 D, and the left eye's mean spherical error was -7.27 D. Mean axial length of the right eye was 25.50 mm, and the main axial length of the left eye was 25.62 mm. A negative correlation was found between AR reading and axial length in both the right and left eyes.
CONCULSION: The results of our investigation show that axial length and refractive error are directly correlated, suggesting that more significant axial length modifications may need to be carefully considered when considering refractive procedures.

KEYWORDS: AL (axial length) AR (autoref reading). Myopia

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Introduction

The most common refractive error worldwide is myopia. It is a significant factor in 75% of refractive error-related issues, with adverse effects on the social and economic fronts. Due to its overall frequency, significant social and economic issues are raised by this non-life-threatening illness.[1-2].

Patients with high myopia are more likely to develop glaucoma, lacquer cracks, chorioretinopathy, as well as retinal detachment, in addition to other visual abnormalities. 3. Over 25% of people in Western Europe have myopia, comparable to the Middle East and America.[3-12] Some student studies conducted in Singapore and Hong Kong revealed a high incidence of 82% to 90%. [13-14] Myopia affects 161 million individuals worldwide, according to a WHO report from 2002, while some researchers contend that this number understates the severity of the problem. [15-16]

There are several different types of myopia, including pathological and physiological myopia either axial or nonaxial myopia. Based on when it first appears, myopia

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can be categorized into three groups: initial adult, elderly, and youth. Its cornea, aqueous humor, lens, and vitreous humor are the four ocular components that influence how well an eye can focus. As a result, essential elements impacting an eye's dioptric power include the corneal curvature, anterior chamber depth, lens thickness, and axial length. If the axial length (AL), lengthening (myopia), or shortening cannot be corrected by the cornea and lens, refractive defects become visible (hyperopia). Axial length received the most excellent attention because it is the primary determinant across both myopia and hypermetropia. [17]

Despite several research studies on the link between axial length and refractive error, this study would have to examine the relationship between axial length and myopia in the local community. It will offer many possibilities for additional research on this crucial subject.

Material and Method

Between January 2021 and June 30, 2021, 100 patients who visited the eye clinic at DHQ Hospital Abbottabad were investigated prospectively by Prospective longitudinal case series. Refractive errors, intraocular pressure, fundus photography in color, optical coherence tomography (OCT, DRI OCT-1; Topcon Corp, Tokyo, Japan), and the best-corrected visual acuity using the SNELLENS chart were all completed on every patient at every visit. At the initial visit and then every 12 months following that, the measurement of the axial length utilizing ocular biometry (IOL Master; Carl Zeiss Germany). At each exam, the IOL Master measurements were taken five times, with the analysis using the average value. The following conditions had to be met in order to be excluded:

1. Eyes with severe cataracts (Emery and Little classification, grade 3 or greater)
2. A lack of fixation
3. A history of eye surgery during the past 12 months, such as cataract surgery

Preoperative or postoperative measurements were examined if the patients received intraocular surgery, like cataract surgery, during the observation time; however, differences among preoperative and axial length readings were excluded from the analysis because the surgery affected axial length. The hospital's ethical review board gave this study their blessing, and it complied with the Helsinki Declaration. The paired t-test was used to discover the variations in axial length. Paired Samples Correlations analysis was used to assess categorical variables. It combined the variations in axial length with a follow-up duration and calculated the variations in axial length each year. Statistical analysis software named SPSS V23 was used for all calculations. P values under 0.05 were deemed significant in statistics.

Results

One hundred individuals were examined; 49 were men, and 51 were women. (Table 1) Fifteen patients were over 25 years old, while 85 patients were under 25. Nineteen years old on average. (Table 2,3) The mean spherical errors for the right and left eyes, respectively, were -7.29 D and -7.27 D. Right eye's main axial length was 25.50 mm, while the left eye's main axial length was 25.62 mm. (Table 4) Participants in the study discovered a negative association between axial length and AR reading, with coefficients of correlation of -.55 (RT) and -.44 (LT) eye. (Table 5)

Table 1. Gender distribution (n=100)

Gender	Frequency	Percent
Male	49	49.0
Female	51	51.0
Total	100	100.0

Table 2.age distribution (n=100)

Age Group	Frequency	Percent
Below 25 years	85	85.0
25 years and above	15	15.0
Total	100	100.0

Table 3. Descriptive statistics (n=100)

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	5.00	45.00	19.2400	6.43086

Table 4. Statistical (T-Test) analysis (n=100)

PAIRED SAMPLES STATISTICS

		Mean	N	Std. Deviation
Pair 1	AR reading R/E spherical	-7.2900	100	4.76118
	Axial length (Right)	25.5021	100	1.79980
Pair 2	AR reading L/E spherical	-7.2790	100	5.20763
	Axial length (Left)	25.6214	100	2.22866

Discussion

There are more than 2 billion people who have a refractive error. Worldwide, the prevalence of sickness varies by area; for example, more than 25% of Europeans and 80% of Asians were discovered to be affected [18]. Seventy-five percent of refractive errors are due to myopia. When accommodation is at rest in myopia, incoming light rays are concentrated in front of the retina [19]. Axial length is a significant factor of refractive error and a frequent contributor to non-syndromic myopia. We can infer that as the axial length of an eye rises, there is a myopic shift in the eye because current study results showed that spherical refractive error (AR reading) of both eyes was negatively correlated with axial length with the coefficient of correlation -0.55 (RE) and -0.44 (LE). In a study by Jyoti Arora et al. [20], it was discovered that there was a negative association between axial length and spherical inaccuracy. Axial length in myopes was shown to be relatively higher than in hyperopes, according to Cheng et al. [21]. Refractive error and axial length have a significant correlation, according to Grosvenor and Scot[22]. Wang et al. made an additional observation[23] that axial length rises with refractive error. In a study involving [24] myopes and [22] hyperopes, Llorente et al. discovered that the axial length in myopes (25.16 mm) is greater than in hyperopes (22.62mm). Mean axial lengths of the right and left eyes in our investigation (25.50mm and 25.50mm, respectively) were comparable to those in the study by Llorente et al.[24] Our study's male-to-female refractive error ratio is almost identical to the findings of Jyoti Arora et al. 20's investigation. Iyamu et al. discovered a highly substantial negative connection between axial length and spherical refractive error. (r= -0.53) [25.] However, the association between refractive error and axial length was not shown to be particularly strong by Main stone et al. [26] the age range, spectrum of refractive errors, sample size, and various races can all affect the results differently.

Different refractive errors are affected by corneal curvatures. The lack of known corneal curvatures in our investigation constituted a constraint. Future research should focus on determining the precise relationship between refractive errors and axial length. With the findings of our study, it can be said that there is a straightforward association between axial length and refractive error. As the number of refractive surgeries, such as LASIK, to correct refractive problems rises daily, relevant data from these studies is crucial for these procedures. Since corneal curvatures have significant refractive errors, this discovery opens new avenues for further study these ocular factors.

Table 5. statistical (Paired Samples Correlations) analysis (n=100) Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	AR reading R/E spherical & Axial length (Right)	100	-.550	.000
Pair 2	AR reading L/E spherical & Axial length (Left)	100	-.448	.000

Conclusion

The results of our investigation show that axial length and refractive error are directly correlated, suggesting that more significant axial length modifications may need to be carefully considered when considering refractive procedures.

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