Section: Ophthalmology

Original Research Article

A CLINICAL STUDY ON THE CORRELATION BETWEEN AXIAL LENGTH, CENTRAL CORNEAL THICKNESS, CORNEAL CURVATURE AND INTRA OCULAR PRESSURE IN MYOPES AND EMMETROPES IN NORTH KARNATAKA POPULATION

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Abstract

Background: Myopia, or shortsightedness, is a form of refractive error. It is interrelated to the intraocular pressure, central thickness of the cornea, corneal curvature and axial length. **Materials and Methods:** Out of 110 patients, 55 (fifty-five) had myopia, and 55 (fifty-five) were normal, healthy volunteers. Both groups were compared with various ophthalmological parameters like the Snellen's chart or Landolt's C chart, retinoscopy, and auto-refractrometry to find out refractive error. Ultrasound scanner, pachymeter, Goldman applanation tonometer, and significant findings were noted and compared. **Result:** Comparison of axial length, corneal curvatures, central corneal thickness and intraocular pressure in both myopes and Emmetropes, and every study had significant p values. **Conclusion:** The effect of myopia was observed in axial length variations and a rise in intra-ocular pressure and thickness of the central cornea. Hence, these impart diagnostic value for optometrists.

INTRODUCTION

Refractive errors are one of the most common ocular disorders affecting vision observed in myopia. It is characterized by the elongation of the eyeball, which results in light focusing in front of the retina instead of directly on it.

Etiologies of myopia have been attributed partially to heriditory and partially to environmental factors, and both are believed to have a substantial impact on the magnitude of the myopic problem. In the majority of cases, myopia is axial, and it has a certain higher degree that is due to an increase in the anterior posterior diameter of the eye.[1] It has been stated that the change in axial length of the refractive state of the eye varies by three diapers. Intraocular pressure is the pressure maintained inside the eyeball in a normal condition, which is exerted by the volume of solid and liquid contents of the eye and the causticity of its coat.[2] The normal range of intraocular pressure in humans is 10–20 mm Hg. Myopia is considered a risk factor for primary open-angle glaucoma. Myopes tend to raise the intraocular pressure. In myopia, there is a decreased central thickness of cornea.[3] It is an important diagnostic point for myopia. The axial length, intraocular pressure, and center thickness of the cornea are interrelated with myopia.[4] Hence, an attempt is made to evaluate these factors to study myopia and its degree.

MATERIALS AND METHODS

110 (one hundred and ten) patients aged between 18-55 years of age regularly visited the ophthalmology department of KBN University Medical College Hospital in Kalaburagi, Karnataka-585104 were studied.

Inclusive Criteria

Patients diagnosed with myopia and no other ocular diseases. The patients gave their consent for study in writing was selected for study.

Exclusion Criteria

Patients with hazy corneas, ocular trauma or opacity, or keratoconus. Any current conjunctival or corneal infection, manifestation of nystagmus was excluded from the study.

Methods: Apart from 55 myopic patients, 55 normal healthy volunteers (emmetropic) were selected for the study. Every patient was studied with a previous history of corneal surgery, including refractive surgery.

A detailed ocular examination was conducted on every patient's visual acuity, with or without a pin, which will be taken with the help of Snellen's chart for literates and Landolt's chart for illiterates. Retinoscopy and auto-refractrometry were used to

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find out the refractive error. The conjunctiva, sclera, cornea, iris, pupil, anterior chamber, lens, posterior chamber, and post-segment were examined. Axial length was measured by an ultrasonic scanner. A central corneal thickness was measured by pachymeter. Corneal curvature is measured by auto-refractrometry, and intraocular pressure is measured by the Goldman applanation tonometer under topical anesthesia with proparacaine eye drops (0.5%).

The duration of the study was from January 2023 to May 2024.

Statistical analysis: Various parameters to find out the axial length, degrees of myopia, corneal curvatures, and intraocular pressure were compared in myopics and emmetropics with the t test, and significant results were noted. The statistical analysis was carried out in SPSS software. The ratio of males and females was 1:1.

RESULTS

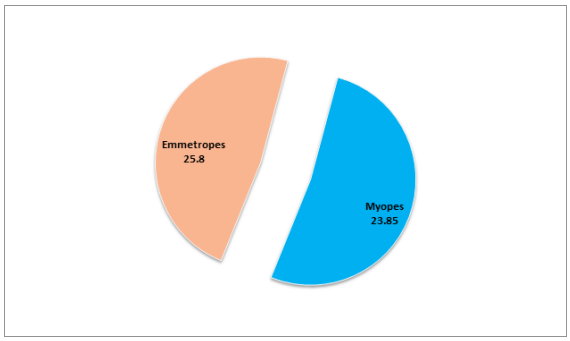

Figure 1: Comparison of Axial length in myopes and Emmetropes

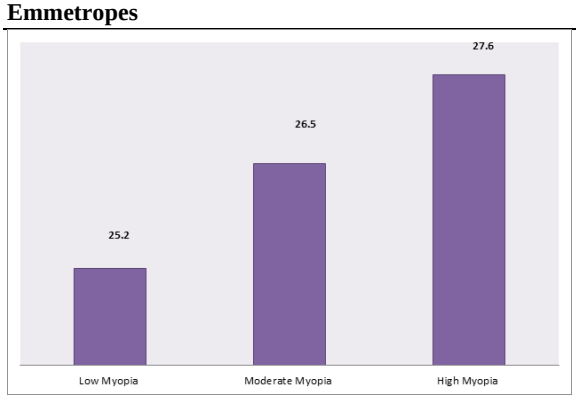

Figure 2: Study of degrees of Myopia by Axial length (AL)

[Table 1] Comparison of axial length in myopes and emmetropes: Axial length was 25.8 (± 1.2) in myopes, 23.5 (± 0.9) in emmetropes. The t test was 12.5 and p<0.001 (the p value was highly significant).

[Table 2] Study of degrees of myopia: low myopia was 25.2 (± 0.5), moderate myopia was 26.5 (± 0.3), high myopia was 27.6 (± 0.4), and p<0.001 (p value was highly significant).

[Table 3] Comparison of corneal curvature in myopia with emmetropes (measured by auto-karatometer) 43.2 (± 1.4) in myopes, 42.7 (± 1.3) in Emmetropes, t test 2.05 and p<0.04 (p value was highly significant).

[Table 4] Comparison of Intraocular Pressure in Myopics and Emmetropics: 15.6 (± 2.4) in myopics, 14.8 (± 2.1) in emmetropics , t test was 2.08 and p<0.004 (p value is highly significant).

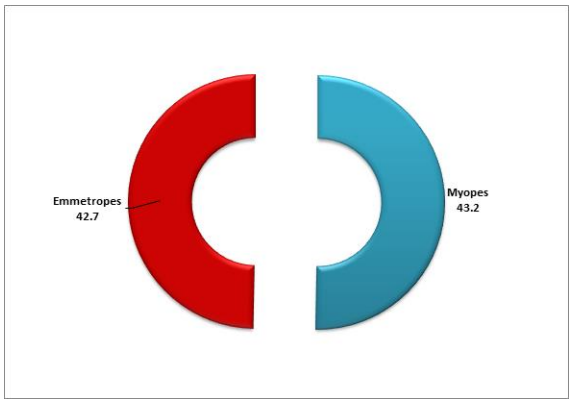

Figure 3: Comparison of corneal curvature in Myopia with Emmet ropes (Measured Auto Keratometre)

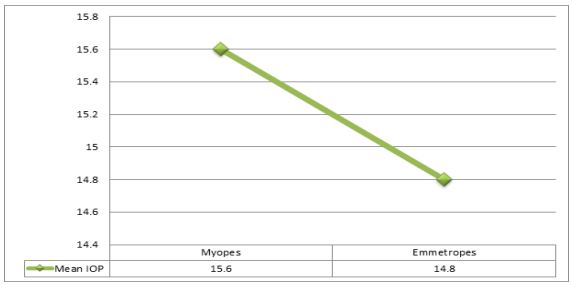

Figure 4: Comparison of Intraocular pressure of Myopes and Emmetropes

Table 1: Comparison of Axial length in myopes and Emmetropes. N- 110.

Parameter	Myopes N=55	Emmetropes M=55	t test	p value
Mean AL (mm)	25.8 (± 1.2)	23.5 (±0.9)	12.5	P<0.001

AL= Arial length (p value is highly significant)

Table 2: Study of degrees of Myopia by Axial length (AL). N-110

Degree of Myopia	Mean AL	p value
Low Myopia	25.2 (± 0.5)	P<0.001
Moderate Myopia	26.5 (± 0.3)	P<0.001
High Myopia	27.6 (± 0.4)	P<0.001

P<0.001 = p value is highly significant

Table 3: Comparison of corneal curvature in Myopia with Emmet ropes (Measured Auto Keratometre). N-110

Parameter	Myopes N=55	Emmetropes P=55	t test	p value
Mean (CCD)	43.2 (± 1.4)	42.7 (± 1.3)	2.05	P<0.04

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CC = corneal curvature
p<0.001 (p value is highly significant

Table 4: Comparison of Intraocular pressure of Myopes and Emmetropes. N-110

Parameter	Myopes N=55	Emmetropes N=55	t test	p value
Mean IOP (mm Hq)	15.6 (± 2.4)	14.8 (± 2.1)	2.08	P<0.004

IOP = Intra ocular pressure
P<0.004 = (p value is highly significant)

DISCUSSION

Present clinical study in correlation between axial length, central corneal thickness, corneal curvature, and intraocular pressure in myopes and Emmetropes in the North Karnataka population. In the comparative study of the axial length of myopes and emmetropes, Myopes 25.8 (± 1.2) and 23.5 (± 0.9) in emmetropes, the t test was 12.5 and p value was highly significant [Table 1]. The degrees of myopia was 25.2 (± 0.5), 26.5 (± 0.3), and 27.6 (± 0.4), i.e., mild, moderate, and severe, and the p value was highly significant (p<0.001) [Table 2]. In the comparison of corneal curvature, also myopes had 43.2 (± 1.4), 42.7 (± 1.3) in Emmetropes, t test was 2.05, and p value was highly significant (p<0.001) [Table 3]. In the comparative study of intraocular pressure Myopic patients had 15.6 (± 2.4) and 14.8 (± 2.08) in Emmetropes, t test was 2.08, and the p value was highly significant (p<0.001) [Table 4]. These findings are more or less in agreement with previous studies.[5-7]

This study provides valuable insights into the structural differences and inter-relationship of ocular parameters in myopic and emmetric eyes. Additionally, the role of biomechanical interventions such as orthokeratology and scleral reinforcement procedures in molding ocular biomechanics and preventing myopia progression warrants further investigation.[8] The pathological myopia is that type of myopia, which is accompanied by degenerative changes occurring particularly in the posterior segment of the eye. It is usually associated with the lengthening of the antero-posterior length of the eyeball. The presenting symptoms were defective vision, musculae volitans and night blindness.[9] The signs are a prominent eyeball, a large cornea, a deeper anterior chamber, and a and a large pupil with a sluggish reaction to light. The fundus changes are large and pale optic disease myopic crescent, degenerative changes in retina, choroid, macula and fovea (e.g., Foster-Fuch's spot, macular degeneration), posterior staphyloma, and degenerative changes in vitreous.[10]

Central corneal thickness (CCT), Intraocular pressures also vary by gender, old age, and if the patient is taking any drugs like latanoprost.[11] Moreover, CCT and ocular pressure are also interrelated with ocular hypertension, open angle glaucoma, or glaucoma with normal ocular pressure, IOP is still a very important factor in the development of glaucoma.[12]

CONCLUSION

The effect of myopia was observed in axial length variations, a rise in intraocular pressure, and the thickness of the central corneal variations. These parameters will help the ophthalmic surgeon confirm the diagnosis of myopia, but such clinical trials must be conducted in a large number of patients in a hi-tech hospital of ophthalmology where the latest techniques are available to confirm these significant values because the etiology of myopia is still unclear. **Limitation of Study:** Owing to the location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

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