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# Pattern and Presentation of Corneal Radius of Curvature, Axial Length, Central Corneal Thickness and Management of Pathological Myopia Among 18-50 Ages in Tertiary Eye Care Center

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**ABSTRACT**

**Purpose:** To evaluate the pattern of corneal radius of curvature, axial length, center corneal thickness & management of pathological myopia in a tertiary eye hospital.

**Methods:** 60 degenerative myopic who had diagnosed as a pathological myopia selected for this study. Procedure of measurement including Visual acuity, Refraction, Pachymetry, A-scan, Keratometry, Contrast sensitivity, Color vision. Treatment includes spectacle, contact lens, low vision aids. Patient with any media opacity &had done any intra ocular surgery were excluded.

**Results:** Among total respondents mean age was 27.01±9.22,where females (58.30%) were more common than in males(41.60%) & most of them were students by occupation.28% were consider as a genetic factor in pathological myopic cases. Almost 50% had improvement in visual acuity to normal vision & 80% improved at near visual acuity. Mean axial length was 28.26±2.02 mm, mean CCT was 515±28.22 µm & mean corneal radius of curvature was 7.59±0.27 mm. There was a significant correlation between axial length & CCT( $p<0.01$),between axial length & dioptric value($p<0.01$).Most commonly seen in fundus features associations were tigroid fundus(84.16%), temporal crecent formation (39.16% ), tilted & pale disc(8.30%). 68.30% were improved vision by spectacle,18.30% by CL & rest other by low vision aids along with spectacle (13.30%).

**Conclusion:** Most of patients were managed by spectacle, contact lens, low visual aids & other non-optical devices. Almost most of patient's visual acuity improved both distance & near. Again, some of the patient's visual acuity didn't improve.

**KeyWords:** Axial length, Central corneal thickness, Corneal radius of curvature, Low vision aids, Myopic degeneration.

## Introduction

Pathological myopia also called degenerative myopia which is rapidly progressive error associated

with degenerative changes in the fundus of the eye.[1] Progressive myopia depicts a subgroup of myopia that affects almost 3% of the world Population.[2] Degenerative myopia is consider as major cause of low vision and blindness worldwide.[3] It is related to great clinical significance of vision loss as it is progressive, irreversible and affects individuals most early during their adult life. The overall global prevalence is estimated to be 0.9% to 3.1% with regional variability. Visual impairment related prevalence of pathologic myopia has been reported as 0.1% to 0.5% in European studies and the rate is higher in Asian studies, which is 0.2% to 1.4%. [2]

Primary risk factors that is considered for pathologic myopia is older age, greater axial length and higher myopia spherical equivalent.[4] Again, female gender, larger optic disc area and the family history is also act as risk factors for pathologic myopia.[5] The role of education level in the development of pathologic myopia is currently unclear.

Pathologic myopia can be along with other ocular as well as systemic diseases. For instance, Down'syndrome,Ocular Albinism, infantile Glaucoma, Marfan's syndrome, Retinopathy of prematurity, Ehler's Danlos syndrome, Low birth weight and maternal alcoholism. Most commonly found in the fundus is annular crescent also named temporal crescent. Besides, tesselleted fundus, lacquer cracks, foster fuch's spot, lattice degeneration, posterior staphyloma can be associated.[6] In later condition, the thinning of the layers may lead to degenerative changes in the peripheral retina including retinal holes and lattice degeneration which puts one at risk for retinal detachment.[6]

The pattern of management of pathologic myopia would be optical such as Spectacle correction, Contact lens. Besides, low vision aids and rehabilitation plan can help to gain a better visual status. Overall, with proper and appropriate management as well as services will allow patients to continue or to improve daily living tasks, independency & quality of life which can achieve a better visual condition.[7,11]

**Methodology**

This was a hospital based prospective study which has been conducted at the low vision department of CEITC. Patient with 18-50 years were assessed within a period September 2022 to October 2023. We selected the sample according to the complaint of the patient as well as diagnosed with pathological myopia. Patient with any other systemic and ocular pathology as well as who had done any ocular surgery were excluded from the study. Demographic and other relevant histories were recorded from the patients in a structured questionnaire by face -to-face interview before the ocular examination. Uncorrected, Pinhole distance visual acuity was measured monocularly by Snellen Acuity chart. Aided visual acuity was measured for the patients who have previous spectacles. Near visual acuity was measured with the help of 'N' Notation near vision chart. All patients were evaluated with slit lamp to see any abnormality in the anterior segment and Pupil evaluation with direct, indirect and swinging flash light reflex test were done by torch light under the guidance of the ophthalmologist. Corneal curvature(both horizontal and vertical) in each eye were measured by the help of Keratometer. Axial length was measured through the help of A-scan.CCT was measured by the pachymetry. Besides Color vision was performed by Fransworth D-15 test and Visual field test was analyzed by Confrontation method.Dry refraction were done(as all patient above 17) to assess the total refractive status of the eye . Lastly, those who were low vision due to degenerative changes in the retina managed with optical & non-optical devices for enhancing quality of life. After completing data collection, all data were entered

in Microsoft Excel sheet and converted into SPSS (version 16.0) .All quantitative data analysis was performed with SPSS. Statistics used are frequency distribution, percentage distribution, measurement of central tendency and measures of dispersion (Standard deviation). All data were presented in an appropriate form like tabulation and graphical presentations were used in this study to present data. Graphical presentations of data were done with the help of Microsoft office excel sheet.

**Results:**

In this study among 60 patients with pathological myopia (18-50 years of age), where the mean, median

& mode were 27.01 years, 24 years and 18 years respectively. The standard deviation being 9.22 means the patient ages varied significantly.Among them,female were more (58.33%) than male(41.67%).
In this study there were three age categories.18-30 years,31-40 years,41-50 years of patient with pathological myopia were affected by respectively 73.3%,18.3% & 8.3%.Among them 18-30 years patients were more affected.

**Table-01:Demographic Characteristics of the patients.**

| Demographic Characteristics | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age | 18-30 years<br>31-40 years<br>41-50 years | 44<br>11<br>5 | 73.3<br>18.3<br>8.3 |
| Gender | Male<br>Female | 25<br>35 | 41.67<br>58.33 |
| Occupation | Housewife<br>Shopkeeper<br>Student<br>Teacher<br>Corporate<br>Farming<br>Others | 11<br>3<br>33<br>2<br>3<br>2<br>6 | 18.30<br>5<br>55<br>3.30<br>5<br>3.30<br>10 |

**Table-2: Genetic history & Color vision test among study respondents:**

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| Family History | Father<br>Mother<br>Both father & Mother<br>Brother & Sister<br>None | 7<br>5<br>1<br>4<br><br>43 | 11<br>8<br>2<br>7<br><br>72 |
| Color Vision | Normal<br>Protane<br>Tritane | 39<br>7<br>14 | 65<br>12<br>23 |

Here, Genetic history shows 28% among the total respondents.

**Table-3: Unaided visual acuity & aided visual acuity after correction in the study**

| Visual acuity | Unaided visual acuity | Percentage (%) | Visual acuity after optical correction | Percentage (%) |
|---|---|---|---|---|
| 6/6-6/18 | 6 | 5 | 59 | 49.70 |

| | | | | |
|---|---|---|---|---|
| <6/18-6/60 | 22 | 18.30 | 52 | 43.30 |
| <6/60-3/60 | 38 | 31.70 | 5 | 4.17 |
| <3/60-PL | 54 | 45 | 4 | 3.30 |
| Total | 120 | 100 | 120 | 100 |

**Note:** VA is counted in total 120 eyes.

**Table 4: Percentage of near visual acuity improvement among study population**

| Near Visual Acuity | Frequency Before correction | Percentage (%) | Improved near visual acuity | Percentage (%) |
|---|---|---|---|---|
| N8 | 33 | 55 | 48 | 80 |
| N10 | 9 | 15 | 6 | 10 |
| N12 | 8 | 13.30 | 3 | 5 |
| N14 | 3 | 5 | 3 | 5 |
| N16 | 6 | 10 | 0 | 0 |
| N24 | 1 | 1.60 | 0 | 0 |
| Total | 60 | 100 | 60 | 100 |

Near visual acuity were measured binocularly by N acuity chart.
After correction near visual acuity improved to N8 about 80% ,N10 about 10% ,N12 & N14 about 5% each.

**Table-05: Correlation between Axial length & Central Corneal Thickness:**

| Characteristic | Total eyes | Mean | Std. Deviation(±) | r value | P value |
|---|---|---|---|---|---|
| Axial length | 120 | 28.26 | 2.02 | -0.234 | P<0.01 |
| Central Corneal Thickness | 120 | 515 | 28.22 | | |

According to the outcome to Pearson's correlation test between axial length and central corneal thickness, with the increasing of axial length, CCT found to be decreased.
Moreover, the test found statistically significant (r= -0.234, p<0.01)

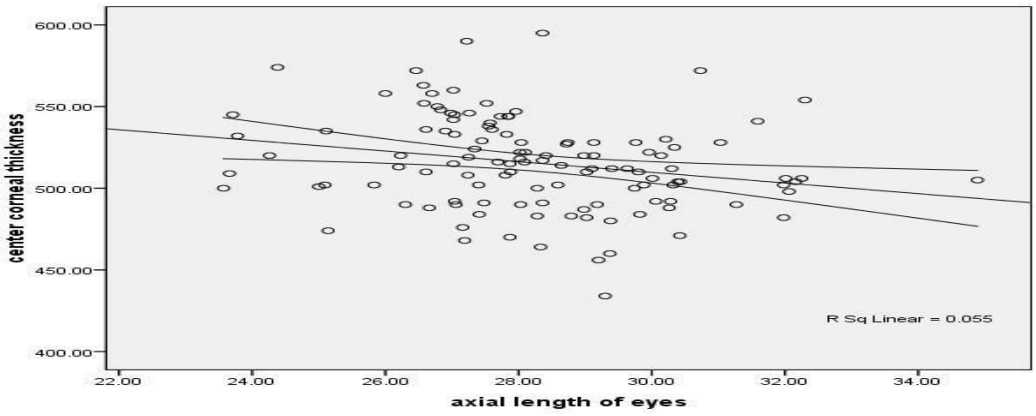

**Table-06: Correlation between dioptric value & axial length according to study population**

| Characteristic | Total eyes | Mean | Std. Deviation | r value | P value |
|---|---|---|---|---|---|
| Dioptric Value | 120 | -13.5 | 5.55 | -0.699 | P<0.01 |
| Axial length | 120 | 28.26 | 2.02 | | |

Among 120 eyes, mean dioptric value was found -13.5±5.55 D & mean axial length was found 28.26±2.02 mm.There was done Pearson's correlation between dioptric value & axial length, that was found statistically significant (r= -0.699, p<0.01).

**Table-07:Optical Management & improvement of vision after correction in the study**

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| Optical Management | Spectacle | 41 | 68 |
| | Contact Lens | 6 | 10 |
| | Both Spectacle & Contact Lens | 6 | 10 |
| | Spectacle & Distance device | 5 | 9 |
| | Spectacle & Near Device | 2 | 3 |
| Improvement 0f Vision | Spectacle | 41 | 68.30 |
| | Contact Lens | 11 | 18.30 |
| | Both Spectacle & Low Vision Devices | 8 | 13.30 |

**Discussion**

In this study, degenerative myopia was found more common in female (58.30%), whereas male consider as 41.60% of study population (n=60) & genetic factor regarding pathological myopia was found about 28% of total respondents.

Similarly, in the study which is done by Ayman Elnahry-"prevalence of pathological myopia in Egypt",[8] where they showed females (53.6%),males (46.4%) & another project, "Clinical study between the axial length & degenerative fundus", showed similar kind of contribution between male (62.60%) & female (37.40%) [6,8] .In the study of "Clinical evaluation of pathological myopia", found 30% association of family history in degenerative myopia.[9]

Most common complaint in degenerative myopic cases were blurring of vision associated with headache(37%).The distribution of uncorrected visual acuity had various range ,where < 3/60 – PL vision was found in almost 45% cases. However, after optical correction between 6/6-6/18 were found around 50% of the study population. Moreover, similar condition happened in near visual

acuity recording. Before correction it was 55 % N8 & after correction it increased to 80% N8 of the total population.

Parameter of the eyeball of degenerative myopia was found altered in this study. Such as, mean axial length was found (28.26±2.20),which was larger than normal eyeball, mean CCT was (515±28.2 µm) slightly declined than normal & there was negative correlation between axial length & CCT($p<0.01$) , retinoscopy value & axial length($p<0.01$) of degenerative myopia. Furthermore, the study done in Tamil

Nadu-"A clinical evaluation of pathological myopia" showed similar kind of statistics, axial length massively increased & CCT moderately low in degenerative myopia, [9] .In addition, axial length had decreased central corneal thickness [9]. Another study," A clinical study of axial myopia"- showed there was an increased in the mean of axial length (29.01±2.17) &with the increasing number of dioptric power axial length increases.[10] In this study ,comparison of CRC between male & female did not found statistically significant($p<0.078$), but in the study of 'Axial length and corneal radius of curvature in adults' found statistically significant($p>0.011$) between males & females.

In this study, degenerative fundus changes that commonly seen 40% ( tigroid fundus), 18.70% (temporal crescent), 8.30% (paripapillary atrophy),7.50%(lattice degeneration).Similarly, in the study of "Correlation between the axial length & degenerative fundus changes ",found myopic crescent 52.5%, tessellated fundus (24%) ,lattice degeneration (6.5%), chorioretinal degeneration(8%).Again, "A clinical study of axial myopia" – observed similar kind of statistics.[10]

All patients (n=60) were managed by spectacle(68.30%), contact lens (18.30%),low vision devices(13.30%).Besides, in non-optical devices,41% needed bright light illumination during near activities,59% had counted for other nonoptical devices.

In the literature-"Myopic degeneration & low vision management" by Raju kniti[1],showed spectacle, contact lens, distance device like telescope, near device like magnifier & other non- optical devices are highly popular in the management of low vision patients due to degenerative myopia.[1,11]

**Conclusion:**

Pathological or degenerative myopia is quite different from simple myopia as in this condition degenerative changes occur in the retina, which may leads to profound vision loss. The severity of this problem needs intensive attention as the devastating condition leads to blindness. Information, advices, optical correction, low visual aids, rehabilitation plan can minimize & help in such condition. Accurate current data of the numbers, causes and level of visual impairment & their management are required to play and develop such strategy and rehabilitate services to retards the progression of pathological myopia.

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