**ORIGINAL ARTICLE**

# A Clinical Study to Establish a Correlation Between Degree of Myopia and Degenerative Fundus Changes

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**Abstract**

The aim of this study was to evaluate the correlation between degree of myopia and degenerative fundus changes. Present study was conducted on 100 myopic patients. Refractive status of each eye was evaluated by retinoscopy and fundus photograph of the posterior pole was taken for a record of peripapillary chorioretinal degenerative changes and optic disc evaluation. Peripheral retina was screened for degenerative changes employing an indirect ophthalmoscope. Pearson's coefficient was employed to check any statistically significant correlation. Females were comparatively affected more. Majority of the patients did not have significant family history. Majority of the cases showed some fundus changes more common were tessellated fundus. Axial length is relatively increased in higher degrees of myopia. Peripheral retinal degeneration is more common in moderate to higher degrees of myopia. A strong correlation exists between degenerative fundus changes and higher degrees of myopia.

**Keywords**

Pathological, Chorioretinal Degeneration, Pearson's Coefficient

## Introduction

Myopia is the second most common refractive error and it causes diminution of vision for distance, therefore also known as short sightedness. It is responsible for approximately 75% of the refractive error related complications with serious economic and social consequences. High myopia can have a profound effect on visual acuity of the patient and can cause blindness (1).

Based on the degree of myopia, people with myopia can be classified into two groups:

   i.   Those with low to moderate degrees of myopia (also referred to as simple myopia of up to 6 dioptres).

   ii.   Those with high degree of myopia (referred to as pathological myopia with dioptric power greater than 6 dioptres).

Epidemiologically, the average worldwide frequency of myopia is approximately 30% with traditional subdivision into school myopia and pathological myopia (2). Population based studies have reported the prevalence of pathological myopia to only 2-3%, while simple myopia has a frequent distribution of around 36% (3). The present study is trying to categorize degenerative fundus changes in myopia and attempts to investigate an association between them and the myopic status of the eye.

### Materials and methods

The present study was conducted on 100 myopic patients who presented in outpatient Department of Ophthalmology, Rohilkhand Medical College and Hospital, Bareilly after taking a written consent.

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## Exclusion criteria

1. Patients less than 6 years of age.
2. Corneal astigmatism greater than 2.5 D.
3. Patients with pre-existing posterior segment disorder or an organic disease causing diminution of vision.

After taking a detailed history, examination of uncorrected and best corrected Visual Acuity for distance was conducted on a Snellen's test chart. A detailed slit lamp examination of the anterior segment, keratometry and intraocular pressure evaluation was done to rule out any organic cause for blurred vision. Both dry and a cycloplegic refraction were conducted meticulously to evaluate the true refractive status of each eye. Detailed fundus examination was carried out on a direct as well as indirect ophthalmoscope. All significant degenerative changes were anecdoted on fundus drawings and fundus photographs were taken for the recording and grading of the myopic fundus changes according to Duke Elder's classification (*Table 1*).

**Statistical analysis:** All significant parameters including dioptric status of myopia and grading of myopic fundus changes were statistically analyzed employing 'Pearsons correlation coefficient'. A p-value of $<0.05$ was considered clinically significant.

## Results

A total of 100 patients (ie 200 eyes) were studied and 100% had myopia in both eyes. Majority of patients (71%) had myopia less than 6 dioptres. The incidence of myopia was higher among females (refer Table 2). The highest incidence of myopia was seen in the 11-20 year age group (*Table 3*). Grade 3 changes were seen in myopia of more than 6 dioptres.

*Table.1 Classification of Fundus Changes*

| GRADE 1 | PHYSIOLOGICAL | No specific fundus changes |
|---|---|---|
| GRADE 2 | INTERMEDIATE | Myopic crescent, annular crescent |
| GRADE 3 | PATHOLOGICAL | Tessellations, chorio-retinal degeneration, Forster Fuchs spots, lattice degeneration, paving stone degeneration, posterior staphyloma, pigmentary changes, vitreous degeneration, posterior vitreous detachment, retinal breaks, retinal detachment. |

*Table.2 Sex Disribution*

| Gender | Number of cases | Percentage |
|---|---|---|
| MALE | 46 | 46% |
| FEMALE | 54 | 54% |

*Table.3 Age Wise Distribution*

| Age groups | Number of eyes | Percentage |
|---|---|---|
| 6-10 | 12 | 6% |
| 11-20 | 102 | 51% |
| 21-30 | 34 | 17% |
| 31-40 | 24 | 12% |
| 41-50 | 10 | 5% |
| 51-60 | 10 | 5% |
| >60 | 8 | 4% |

*Table.4 Degree of Myopia & Grade of Fundus Changes*

| Degree of myopia | Number of eyes | Percentage | Physiological Grade 1 | Intermediate Grade 2 | Pathological Grade 3 | Mean grade of fundus changes |
|---|---|---|---|---|---|---|
| < -3.0 D | 70 | 35% | 50 | 20 | 0 | 1.33 |
| -3.0 to -6.0 D | 72 | 36% | 21 | 49 | 2 | 1.75 |
| -6.0 to -9.0 D | 29 | 14.5% | 0 | 1 | 28 | 2.89 |
| -9.0 to -12.0 D | 12 | 6% | 0 | 0 | 12 | 3 |
| -12.0 to -15.0 D | 11 | 5.5% | 0 | 0 | 11 | 3 |
| -15.0 to -18.0 D | 6 | 3% | 0 | 0 | 6 | 3 |

## Discussion

Myopia is defined as a spherical refractive error caused by excessive refractive power which results in anterior displacement of focus from the retina. A WHO report quotes a figure of 161 million visually impaired people across the world caused by myopia and related ocular disorders (4). A slight sex predilection towards females is reported by most studies (5,6,7). Our own study concurred with this view, citing a 54% female preponderance.

Venkatesan et al reported maximum myopia prevalence (45%) in the age group of 11-20 years followed by 21% in the corresponding age group of 21-30 years (6). Concurring with these facts, our study observed a high prevalence of 51% myopia in the age group of 11-20 and 17% in the age group of 21-30 years.

Association of myopia with retinal co-morbidity has long been recognised. The ocular co-morbidities encountered in high myopia include optic nerve crescent, vitreous degeneration, myopic macular degeneration and chorio-retinal changes. Peripheral retina is prone for multifarious degenerations like lattice degeneration, white with-

out pressure, paving stone degeneration, pigmentary changes and retinal breaks. Choroidal tessellations are frequently reported even in mild myopia. Venkatesan et al, in their clinical analysis of fundus changes in myopia, reported 41% tessellations in retinal background (6). Our own study, noticed 24% tessellations in the studied subjects. When classified on the basis of retinal degeneration changes, bulk of simple myopic eyes (< 6D) presented with no chorio-retinal degeneration. Out of the 70 eyes with less than 3D myopia, none presented with fundus degenerative change and only 20 (28.5%) showed a myopic crescent. Myopic crescent was more evident in moderate variants of simple myopia between 3-6D, where it presented in 51 (70.8%) of the 72 examined eyes. The fundus feature of myopic crescent and peripapillary atrophy was near universal in higher grades of myopia. Bansal et al when commenting on the peripheral retinal status of 54 eyes of highly myopic children below 10 years of age reported that nearly one third of them had peripheral retinal degeneration (8). A cross-sectional study by Foster et al reported peripheral retinal changes in 61.7% highly myopic eyes (9). The most common pathology observed included white without pressure (51.7%), lattice degeneration (5.8%), microcystoid degeneration (5%) and pigmentary degeneration (4.2%). The modest detection of peripheral retinal changes is only 16% in our case series. On a graded scale employing Duke Elder's classification of myopic fundus, the pattern of mean fundus changes consistently matched with the degree of myopia. The mean grade of fundus changes for myopes below 3D was 1.33 as against 2.89 for myopes between 6D and 9D; (*Table 4*). The observations also revealed that, all the eyes with myopic status above 9D have some degree of chorio-retinal degeneration. When correlating the dioptric power with fundus grade an extremely strong association is deciphered through the Pearson's correlation coefficient criteria, with an r-value of 0.791 ( p-value < 0.001). Hence a routine refractive check may in fact be an indicator for predicting the degenerative changes in the fundus.

The study did face certain limitations that influenced the validity of some of its findings. Firstly, information derived through the study of a limited number of 100 cases could not be extrapolated for generalization, considering the large subset of myopic population. Secondly, the subjective grading of fundus changes influenced the numerical objective analysis when correlating different parameters of myopia. Despite these limitations the study did manage to bring out the relevant aspects of simple and pathological myopia with regard to chorio-retinal degenerations.

**Conclusion**

While evaluating correlation of dioptric power and degenerative fundus changes we found that bulk of cases (71%) fell under the category of simple myopia (< 6dioptres). Out of these, the majority presented with grade 1 (physiological) fundus changes. The pathological myopic fundus changes (grade 3) were near universal (98.3%) among higher myopes of dioptric power above 6D. Intermediate changes (grade 2) were pronounced in moderate degree of myopia (-3 to -6D). Thus the simple refractive measurement of eye stands a better chance for predicting fundus degenerative changes.

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