

## Clinical study of fundal changes in high myopia

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### Abstract:

**Introduction:** Myopia is one of the most prevalent disorders of the eye. High myopia is associated with comorbidities that increase risks of severe and irreversible loss of vision, such as retinal detachment, subretinal neovascularization, dense cataract, and glaucoma. In recent years, reports from population-based prevalence studies carried out in various geographical areas now give a clear picture of the current distribution of refractive error. This could lead to varied clinical presentation seen in different regions of the world.

**Objectives:** This is a comparative study to know the frequency of fundal changes in different degrees of high myopia.

**Materials & Methods:** This is a comparative study from the cases attending Ophthalmic out patient department of Sapthagiri Institute of Medical Sciences, Bangalore & Vydehi Institute of Medical Sciences, Bangalore, during the period from June 2011 to May 2015 and 250 cases were studied on random selection basis. A thorough clinical examination of the anterior segment of each eye was done using diffuse illumination and slit lamp biomicroscope. The visual acuity & streak retinoscopy was done. All cases were examined with dilated fundus for retinal features.

**Results:** In the present study of 250 cases, 57 cases were having high myopia. The majority of high myopia cases were observed in the age group of 21-30 years [31.6%]. The degree of spherical error in this study ranged from 6.0D to 30D. It was observed that the fundal changes increases with increase in degree of myopia, and above 10D it was seen in almost all cases. In the present study, the incidence of myopic crescent was seen in all cases of high myopia.

**Conclusion:** It is well documented that myopes, especially high myopes, tend to suffer from compromised quality of life owing to various influences from functional, psychological, cosmetic, and financial factors. Individuals with high myopia were reported to have significantly lower vision-related quality of life than those with none, mild, or moderate myopes. An effort is made to highlight detailed fundus features so that high myopic patients should be given special care and all modalities of treatment instituted to improve the quality of life and vision.

**Key words:** High myopia, fundal changes, quality of life, geographic variation.

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### I. Introduction:

The prevalence of myopia is high in oriental race [50-70%] and low in Eskimos, Native Americans and in black Africans. The overall prevalence among Europeans and North Americans is 10-20%. The incidence of myopia among Asian countries especially Japan is 50%.<sup>[1]</sup> The prevalence of high myopia varies considerably in different population and ranges from <1% in Afro-American population to more than 10% in Asian populations.<sup>[2,3]</sup> Greater difference in the prevalence of myopia was found in older school-aged children of different ethnicity. The cross-sectional prevalence of myopia in Australian school children was reported to be 42.7% and 59.1% in 12-year-old and 17-year-old school-aged children of East Asian ethnicity, respectively, whereas the corresponding prevalence rates in European Caucasian children of the same age were 8.3% and 17.7%, respectively.<sup>[4]</sup> Fewer data are available detailing the prevalence of myopia in adults. The prevalence rates were found to vary with age. Owing to the relative scarcity of data from large-scale cohort studies, a more precise statement might be the prevalence rates of myopia in older adults are generally lower than in younger adults. In the Beaver Dam Eye Study<sup>[5]</sup> data collected between 1988 and 1990 showed a significant decrease with age among individuals aged above 43 years. The prevalence of myopia decreased from 42.9% in adults aged 43-54 years to 25.1% in adults aged 55-64 years, further decreased to 14.8% in the 65-to-74-year age group, and then slightly decreased to 14.4% among individuals aged 75 years and above. Another large-scale population-based study in urban Americans aged 40 years or above also showed apparent decline in prevalence of myopia with increased age in females of different ethnicity and the male Whites. However, a bimodal pattern was observed in the prevalence of myopia among African Americans of different age, with the peak prevalence rates found in individuals aged 40-49 years as well as 80 years or above.<sup>[6]</sup> A similar bimodal pattern of myopia prevalence was found in adult Singaporeans aged 40-81 years. Of the relatively high prevalence of myopia

across all age groups in both men and women (range: 25.2–51.7%), the prevalence was also highest among individuals in their forties and seventies.<sup>[7]</sup> It is still under debate whether this age-related variation in the prevalence of myopia results from longitudinal effects or cohort effects.<sup>[8]</sup> However, the bimodal distribution is likely owing to differing influences of axial myopia among younger people, and greater index myopia, due to lens nuclear sclerosis in older people.

## **II. Materials And Methods**

The material for this study is taken from the cases attending Ophthalmic out patient department of Sapthagiri Institute of Medical Sciences, Bangalore & Vydehi Institute of Medical Sciences, Bangalore, during the period from June 2011 to May 2015 and 250 cases were studied on random selection basis. A thorough clinical examination of the anterior segment of each eye was done using diffuse illumination and slit lamp bio microscope. In order to eliminate the factors which might bias the results, the subjects have been selected on the following basis

- All the cases were selected randomly without giving any preference to age, sex, religion, education and socio-economic status.
- Except those related to age changes, patients with other ocular diseases which affect the vision considerably were excluded from the study.
- Aphakic and pseudophakic patients were excluded the study.
- Cases in which retinoscopy was not possible due to abnormalities of the anterior segment were also not considered.
- Patients with systemic diseases which affect the vision considerably were excluded irrespective of the type of defect.
- Patients who have undergone ocular surgery or sustained trauma were also excluded.

The method of study consisted of taking a detailed clinical history. An attempt was made to elicit family history suggestive of refractive error. A thorough clinical examination of the anterior segment of each eye was done using diffuse illumination and slit lamp bio microscope. The visual acuity was recorded using Snellen's chart for the distance and near vision with Jaeger's chart. Retinoscopy was done using a streak retinoscope at a convenient distance of one meter. The refractive error was double checked using auto refractometer. All the patients under 16 years of age were tested using cycloplegics. As generally accepted atropine 1% eye ointment was used under the age of 7 years, and cyclopentolate hydrochloride 1% between 7 and 16 years. Above the age of 16 years Tropicamide 1% or phenylephrine hydrochloride 10% was used. In all patients with manifest accommodative strabismus atropine eye ointment/drops 1% was used irrespective of the age, for refraction. Where atropine 1% was prescribed, the patients were directed to begin the use of drops 3 times a day for 3 days before the examination. Where cyclopentolate hydrochloride 1% was used one drop of it was instilled in each eye followed by a second drop 5 minutes later. Retinoscopy was done after one hour.

Subjective verification and correction as done immediately following the non-cycloplegic refraction. Post cycloplegic test was done 2 weeks after the retinoscopy in case of atropine and 2 days later in case of cyclopentolate hydrochloride. Wherever tropicamide or phenylephrine hydrochloride 10% was used post mydriatic test was done one day after the retinoscopy. Presbyopic correction was also given wherever necessary. Direct & indirect ophthalmoscopic examination was done under full mydriasis in all the cases.

Method of calculation and tabulation: All the calculations were done taking into account the retinoscopic results only. For calculating the degree of error simple transposition of the retinoscopic results were done after giving an allowance for the working distance and tone of the ciliary muscle abolished. The tonus allowance was taken as 1D in case of atropine and 0.75 D for cyclopentolate. In case of tropicamide and phenylephrine hydrochloride 10%, no tonus allowance was given. While calculating the incidence of degree of spherical error, cylindrical component was not taken into consideration and vice versa.

## **III. Results**

In the present study of 250 cases, 412 eyes examined had refractive errors. Out of which 313 eyes [75.97%] were simple myopia and 99 eyes [24.03%] were having high myopia. The majority of high myopia cases were observed in the age group of 21-30 years (31.6%), followed by 11-20 years [29.8%]. The least incidence was observed in the 1-10 years [5.3%] age group. Out of 57 cases of high myopia. 32 cases [56.1%] were males and 25 cases [43.9%] were females. The degree of spherical error in this study ranged from 6.0D to 30D. It was observed that the fundal changes increases with increase in degree of myopia, and above 10D it was seen in almost all cases. In the present study, the incidence of myopic crescent was seen in all cases of high myopia. The most common type of myopic crescent observed in this study was temporal [75.8%] followed by annular [16.9%]. The least common type encountered was inferior crescent [7.3%].

| FUNDAL CHANGES                               | DEGREE OF HIGH MYOPIA |      |            |      |
|--|-----------------------|------|------------|------|
|  | 6.25 –10D             |      | 10D& more  |      |
|  | 42 eyes               |      | 57 eyes    |      |
|  | No of eyes            | %    | No of eyes | %    |
| Vitreous opacities                           | 27                    | 64.3 | 51         | 89.5 |
| Large disc                                   | 40                    | 95.2 | 57         | 100  |
| Tilted disc                                  | 6                     | 14.3 | 11         | 19.3 |
| Myopic crescent                              | 42                    | 100  | 57         | 100  |
| Peripapillary chorio retinal atrophy         | 23                    | 54.8 | 57         | 100  |
| Posterior staphyloma                         | -                     | -    | 1          | 1.8  |
| Pigmentary changes in the macula             | 31                    | 73.8 | 32         | 56.1 |
| Tessellated macula                           | 13                    | 31   | 14         | 24.6 |
| chorio retinal atrophy in the posterior pole | 2                     | 4.8  | 43         | 75.4 |
| Lacquer cracks                               | -                     | -    | 4          | 7.0  |
| Foster fuchs spots                           | -                     | -    | 1          | 1.8  |
| Tesellated background                        | 39                    | 92.9 | 57         | 100  |
| Peripheral retinal changes                   |                       |      |            |      |
| -Lattice degeneration                        | 6                     | 14.3 | 16         | 28.1 |
| -Paving stone degeneration                   | -                     | -    | 12         | 21.1 |
| -Snail track degeneration                    |                       |      | 11         | 19.3 |
| - chorio retinal degeneration                | 7                     | 16.7 | 22         | 38.6 |
| Peripheral cystoid degeneration              | 8                     | 19   | 18         | 31.6 |
| -White without pressure                      | 8                     | 19   | 11         | 19.3 |
| -White with pressure                         | 16                    | 38.1 | 22         | 38.6 |
| -Retinal breaks                              | -                     | -    | 2          | 3.5  |

Table no.1: showing fundal changes in high myopia

### Fundal changes in myopia 6D to 10D

The most common finding was myopic crescent in [100%] of cases, followed by large disc [95.2%], tessellated background [92.9%], pigmentary changes in the macula [73.8%], vitreous opacities [64.3%] and peripapillary atrophy in [54.8%]. Tessellated macula was seen in [31%] of cases, chorio retinal atrophy in the posterior pole was seen in [4.8%] of myopic eyes.

### Peripheral Fundal changes in myopia 6D to 10D

Among the peripheral retinal changes white with pressure [38.1%] was the predominant finding, followed by peripheral cystoid degeneration and white without pressure [19% each], chorio-retinal degeneration [16.7%] and lattice degeneration [14.3%].

### Fundal changes in myopia > 10D

Above 10D of myopia the fundal changes was almost invariable. The prominent change observed was peripapillary atrophy [100%], tessellated background [100%] and large disc [100%]. The macular changes were also invariable. The changes are chorio-retinal atrophy [75.4%], pigmentary changes in the macula [56.1%],

tessellated macula [24.6%], Foster fuchs spot was seen in one case which measured 30D of myopia. Vitreous opacities were seen in [89.5%] of eyes.

#### Peripheral Fundal changes in myopia > 10D

Among the peripheral retinal changes, peripheral chorio-retinal degeneration and white with pressure 22 cases each [38.6%] was the commonest finding observed, followed by peripheral cystoid degeneration 18 cases [31.6%], lattice degeneration 16 cases (28.1%), paving stone degeneration 12cases[21.1%] and snail track degeneration and white without pressure 11 cases [19.3%] each were observed. Retinal breaks [3.5%] were observed in 2 eyes with retinal detachment.

#### IV. Discussion:

A study of 5000 eye OPD patients in year 1966 by I.S.Jain et al<sup>[9]</sup> has shown 15% incidence of myopia of which 16% had high myopia. 84% were simple myopic. In the present study, high myopia was seen in 99 eyes[24.03%] and differs slightly from I.S.Jain et al study.

A study done by I.S.Jain et al<sup>[9]</sup> on urban population shows that the incidence of high myopia increases steadily upto 5th decade. In the present study, it differs by increasing steadily upto 3rd decade, there after it declines.

A study done by Richard M. Klein et al.<sup>[10]</sup> shows that the prevalence of lacquer cracks in pathologic myopia is 4.3%. However, a much larger percentage of patients with myopic macular degeneration develop lacquer cracks. In our study lacquer cracks accounted for 7% of high myopic population.

As per the study conducted by Manoj Shukla et al<sup>[11]</sup> on white with pressure and white without pressure lesions, white with pressure was seen in 27.6% of myopic eyes. In our study, white without pressure accounts to 38.3% of high myopic patients.

A study done by Jose. M. Celorio et al<sup>[12]</sup> showed that out of 218 patients with myopia of 6D or more, 72 [33%] had lattice degeneration.

A cross-sectional prevalence survey conducted by Lam et al<sup>[13]</sup> in Hong Kong demonstrated that the prevalence of lattice degeneration in highly myopic patients is 12.2%. In our study 42.4% of lattice degeneration was seen in our high myopic population.

In a cross-sectional study, up to 61.7% of highly myopic eyes were found to have peripheral retinal change. The most common pathologies included optic nerve crescent (52.5%), white-without-pressure (51.7%), lattice degeneration (5.8%), microcystoid degeneration (5%), and pigmentary degeneration (4.2%).<sup>[14]</sup> High myopia was also suggested to be associated with bilateral rhegmatogenous retinal detachment, a condition of very severe visual morbidity.<sup>[15]</sup> Retinal breaks [3.5%] were observed in 2 eyes with retinal detachment in the present study. High myopia was reported to be associated with idiopathic focal subretinal neovascularization.<sup>[16]</sup> We did not see any case of choroidal neovascular membrane in our study.

In a study by Chang et al,<sup>[17]</sup> The most common myopia-related macular finding in adults with high myopia was staphyloma (23%), followed by chorioretinal atrophy (19.3%). There were few cases of lacquer crack (n = 6, 1.8%), T-sign (n = 6, 1.8%), retinal hemorrhage (n = 3, 0.9%), active myopic choroidal neovascularization (n = 3, 0.9%), and no case of Fuchs spot. The most common disc finding associated with high myopia was peripapillary atrophy (81.2%), followed by disc tilt (57.4%).

In our study, posterior staphyloma was seen in one case only, Lacquer crack is seen in 7% of patients. Chorioretinal atrophy was seen in 80.2% of high myopic patients. The most common disc finding in our study was myopic crescent which was seen in 100% of our cases.

Peripheral cystoids degeneration was found in (50.6%) in our study, while O Malley et al<sup>[18]</sup> reported that this degeneration is present in almost all adults after the age of 20 years.[20].

It was reported by O Malley PF et al<sup>[19]</sup> that paving stone degeneration is present in 22% of adult patients and is bilateral in 38% of them and prevalence increases markedly with increased age. In our study paving stone degeneration was seen in 21.1% of total high myopic population.

#### V. Conclusion

A study of 250 cases of myopia was done. The majority of cases of myopia were observed in the age group of third decade. A slight difference between male and female distribution of high myopia was seen. Fundal changes in myopia were observed to increase as the degree of error increased. Temporal crescent was the commonest type of myopic crescent observed. There exists a definite geographical variation with reference to incidence of high myopia in degree of refractive errors, fundal features and ethnicity. It is well documented that myopes, especially high myopes, tend to suffer from compromised quality of life owing to various influences from functional, psychological, cosmetic, and financial factors. Individuals with high myopia were reported to have significantly lower vision-related quality of life than those with none, mild, or moderate myopes. All cases

have to be examined with due importance to dilated fundus examination so that timely care is given and to enhance the quality of life of such patients.

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