

# FUNDUS FINDINGS AND VISUAL FUNCTIONS IN PATHOLOGICAL MYOPIA

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## ABSTRACT

**Background:** Visual function is a group of specific properties of eye which are essential for comprehensive vision of an individual. Pathological myopia is the condition of eye in which axial length of eye is more than 24mm and refractive error is more than -6 D. **Objectives:** To evaluate the visual functions in patients with high myopia and to find the most common finding of fundus in pathological myopia. **Methodology:** This was a descriptive cross sectional study which was conducted on seventy five subjects. Samples were selected by using non probability purposive sampling technique. Visual functions were assessed by using i.e visual acuity by Snellen chart, contrast sensitivity by lea numbers, visual field by confrontation method, color vision by D-15, glare by BAT (brightness acuity test), fundus finding by indirect ophthalmoscope. **Results:** Study was conducted on 75 subjects (150) eyes. Best corrected visual acuity (BCV) was 6/6 to 6/9, 6/9 to 6/12 and 6/9 to 6/18 in myopes with -6.00DS to -8.00DS, -8.00DS to -10.00DS, -11.00DS and in -15.00DS respectively. Visual field in myopes from -6.00DS to -8.00DS was normal, it was constricted in myopes more than -9.00DS. Contrast sensitivity (CS) of Myopes having refractive error of -6.00DS to -8.00DS, -9.00DS to -14.00DS and  $\geq -14.00$  DS had 1.25%, 1.25%-2.50 % and 5% contrast respectively. 55 subjects having refractive errors from -6.00 DS to -12.00 DS had normal color vision for more than -12.00DS refractive errors. Color vision was defective in 45% subjects specially for blue color. Glare was present in 15 myopes with refractive error more than -14.00DS. The most common fundus findings in pathological myopes were myopic crescent, temporal tilting of optic disc and posterior staphyloma in severe pathological myopes. **Conclusion:** Visual functions were reduced in high degree of myopia. Myopic crescent, temporal displacement of disc and posterior staphyloma are most common fundus findings in pathological myopes.

**Key words:** Pathological myopia, Visual acuity, Color vision, Contrast sensitivity, Visual field, glare.

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## INTRODUCTION

“Visual functions” is a group of five specific properties of eye including Visual acuity, Visual field, Contrast sensitivity, Colour vision, Glare sensitivity which are essential for comprehensive vision of an individual.<sup>1</sup> Visual functions are very important to screen out any sign of unsuspected disorder, to investigate suspicions of disorder, to monitor the stability and instability of disorder, predicting functional visual abilities and determining socio-legal eligibilities.<sup>2</sup>

Visual acuity is considered as a measure of form sense, so it refers to the spatial limits of visual discrimination. It is the measurement of the capability to differentiate between two stimuli separated in space at high contrast in relation to background.<sup>1</sup> The method by which we measure the function of fovea is the measurement of visual acuity. Visual acuity (VA) is measured by Snellen's test type, Landot C, Tumbling E, Sheridian-Gardiner HOTV, Pictorial vision charts, Broken wheel test, Cardiff acuity cards, Numbers, Bailey Lovie, PV Numbers, Patti Pics, Sloan Letters ETDRS, Log Mar chart, Soniksen silver test, Lea Symbols and Sjogren hand test.<sup>2</sup>

Visual field is an island of vision in the sea of darkness. Extends of normal visual field are 60 degree superiorly, 60 degree nasally, 70-75 degree inferiorly, 100 degree temporally.<sup>1</sup> Visual field includes the area in which eye can see when focusing on a single object. Visual field examination is very important to assess the vision, to investigate suspected disease and to monitor the change in known disease. Visual field examination includes confrontation, tangent screen, amsler grid, kinetic perimetry, static perimetry, hand held perimetry, Humphery visual field test, Goldman visual field test.<sup>1,3</sup> Contrast sensitivity refers to the ability of the visual system to distinguish between an object and its background.<sup>3</sup> Contrast sensitivity (CS) is measured by Arden gratings, Cambridge low-contrast gratings, Pelli-Robson contrast sensitivity chart,<sup>4</sup> Vistech chart, Sine wave grating, Square wave grating. Colour vision is a function of three populations of retinal cones each with its specific sensitivity. It is the ability of eye to discriminate lights of different spectra, regardless of their relative intensities. Colour vision is the capability to differentiate stimulus of light as a function of its wavelength.<sup>5</sup> Colour vision permits to discriminate alterations in

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the division of spectral energies reaching the eye.<sup>6</sup> Glare comes from oblique sources and enters the periphery of the eye thus increasing the background illumination and decreasing contrast. It causes visual fatigue and strain.<sup>7</sup> It can be measured by the simple pen torch and the brightness acuity test (BAT).<sup>8</sup> Pathological myopia is the condition of eye in which axial length of eye is more than 24mm and refractive error is more than -6D.<sup>9</sup> It is also known as degenerative myopia, high myopia, pemicious myopia and malignant myopia. Pathological myopia is characterized by marked fundus changes such as posterior staphyloma, lacquer cracks, lattice degenerations etc. It is associated with high refractive error and subnormal vision after refraction. This type of visual problem is the cause of elongation of eye ball. Pathological myopia occurs in 1% to 9% of adults of different countries. Genetic factors influence the development of myopia. The tissues of myopic eye are stretched and therefore are thinner than normal. This stretching causes different disorders of retina. Stretching of retina in pathological myopia causes atrophy of retina. The areas of retina having atrophy have reduced or no vision. In this way it causes blank patches in visual field of pathological myopes. If it involves the macula, it may affect patient's central vision. Retinal changes at the edge of retina are lattice degenerations and these degenerations may lead to retinal detachment. Stretching may cause breaks in retina which are termed as lacquer cracks. There is no treatment for these cracks. New blood vessels may grow in the areas of cracks and atrophy. These are choroidal neovascularisation (CNV). It is one of the most common causes of visual loss in pathological myopia. These vessels are fragile and very thin and any damage to these vessels causing scarring, if in macular area, is Foster Fuchs Spot.<sup>10</sup>

Prevalence of pathological myopia is increasing, particularly in Asia, and there is predilection for Chinese, Japanese, Arabs, and Jewish are ascertained. Pathological myopia has great impact on both individual and socioeconomics. Progression of visual field in high myopes is 34.4% for refractive error -6D to -9D and it is 38.9% for myopes of more than -9D refractive error.<sup>11</sup> Colour vision in high myopes is mostly normal but there may be some problem with blue color.

The objective of our study was to evaluate the visual functions in patients with high myopia and to find the most common finding of fundus in pathological myopia.

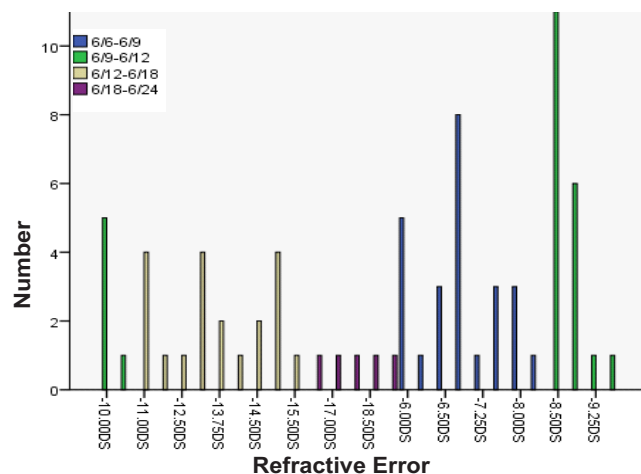
## METHODOLOGY

This cross sectional study was conducted at College of Ophthalmology and Allied Vision Sciences (COAVS), Lahore, from 1<sup>st</sup> September to 30<sup>th</sup> November 2014. This study was conducted on seventy five subjects. Samples were selected by using non probability purposive sampling technique. Patients were selected from out door patients department (OPD) of eye ward of Mayo Hospital Lahore. 75 patients of either sex were registered and visual functions of all subjects were checked using a distance Snellen Visual Acuity charts, Contrast Sensitivity Chart, Ishihara Chart, Bright Acuity Test and confrontation method to determine visual acuity, contrast sensitivity, colour vision, glare and visual field respectively. Fundus findings were assessed using indirect ophthalmoscopy. Subjects with myopia more than -6D were included in study. Patients having other vision threatening diseases were excluded from the study. Data was recorded on proformas and the results were analyzed and tabulated by using SPSS 13.0 software.

## RESULTS

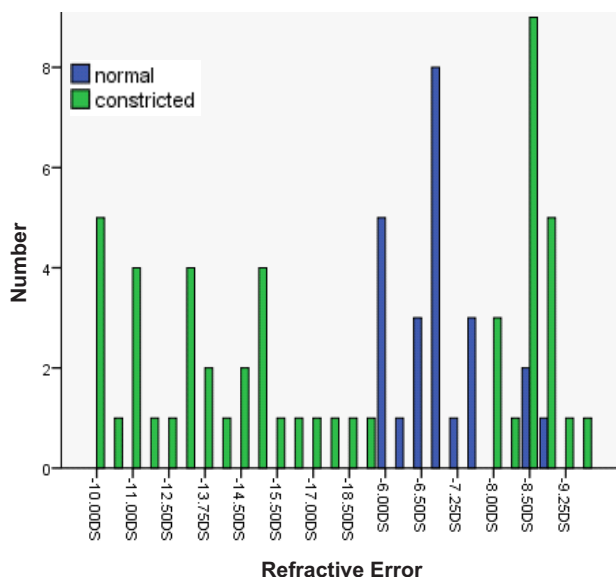
In this study, best corrected visual acuity (BCV) was 6/6 to 6/9 in myopes with -6.00DS to -8.00DS. It was 6/9 to 6/12 in subjects with -8.00DS to -10.00DS. Pathological myopes with refractive error -11.00DS to -15.00DS were with BCV 6/9 to 6/18p BCV was 6/12 to 6/18p in > -15.00DS pathological myopes (Figure I).

**Figure I: Visual acuity of patients**

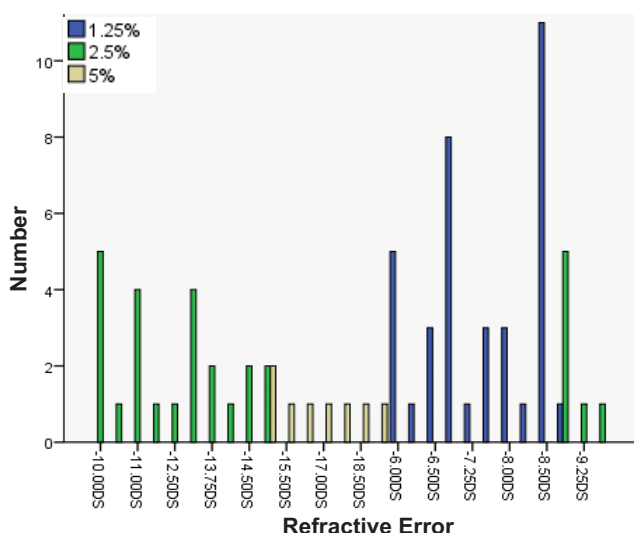


This indicates best corrected visual acuity in pathological myopes is significantly reduced ( $p < 0.005$ ). Visual field in myopes from -6.00DS to -8.00DS was normal, it was constricted in myopes more than -9.00DS (Figure II).

**Figure II: Visual Field of Patients**



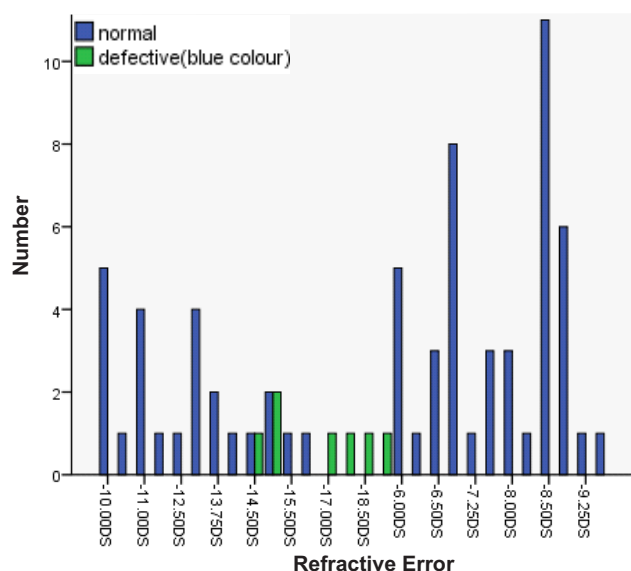
**Figure III: Contrast Sensitivity of Patients**



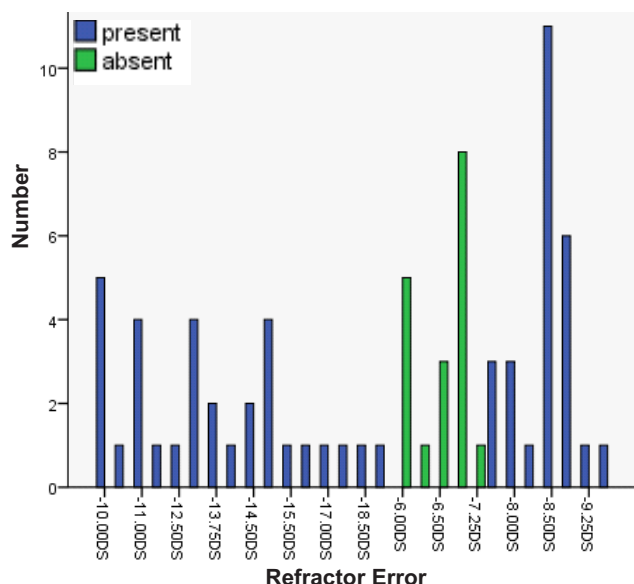
Visual field was significantly reduced ( $p < 0.005$ ). Contrast sensitivity (CS) of 40 subjects (-6.00DS to -8.00DS) out of 75 was 1.25% and of myopes with refractive error -9.00DS to -14.00DS was 1.25% to 2.5%; 60% subjects of this group were with 2.5%. 60% subjects with more than -14.00DS had 5% contrast, others had 2.5% (Figure III). In pathological myopia CS was significantly reduced ( $p < 0.005$ ). Out of 75 subjects (150 eyes), 55 subjects have normal color vision. Their

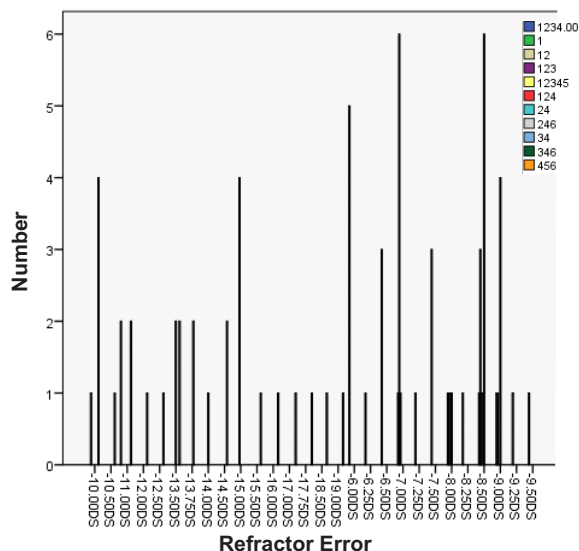
refractive errors were from -6.00DS to -12.00DS. For more than -12.00DS refractive errors color vision was defective in 45% subjects specially for blue color ( $p < 0.005$ ) (figure IV). Out of 75 subjects glare was present in 15 myopes with refractive error more than -14.00DS (Figure V). Glare sensitivity was reduced in 20% subjects ( $p < 0.005$ ). The most common fundus findings in pathological myopes were myopic crescent (100%) temporal tilting of optic disc (70%) and posterior staphyloma (65%) in severe pathological myopes (Figure: VI).

**Figure IV: Colour Vision of Patients**



**Figure V: Glare Sensitivity of Patients**



**Figure VI: Fundus Findings of Patients**

## DISCUSSION

Myopia is a leading cause of visual impairment in present world. It is more prevalent in all refractive errors. Studies have been done to find its risk factors and to treat it. Pathological myopia is one of the common causes of blindness. Kumari Neelam, et al proved in their study in 2012 that Choroidal neovascularisation is one of the leading causes of this blindness which is a common characteristic of pathological myopia.<sup>12</sup> In the study of Shioh-Wen Liou, and Cheng-Jen Chiu, they observed reduced contrast sensitivity function in pathological myopes.<sup>11</sup> In our study contrast sensitivity was reduced from 1.25%- 5% in myopes ranging from -6.00DS to > -14.00DS. Pathological myopia may occur at any age, most commonly between the age of 30 and 40. Prevalence of pathological myopia is increasing, particularly in Asia, and there is predilection for Chinese, Japanese, Arabs, and Jewish are ascertained. Pathological myopia has great impact on both individual and socioeconomics.<sup>9</sup> In pathological myopia visual acuity is reduced for both distance and near objects. Dark adaptation of patient is reduced.<sup>7</sup> Contrast sensitivity of pathological myopes is diminished. According to Liou S-W contrast sensitivity reduces in high myopic patients because of pathological changes in the fundus.<sup>11</sup> Progression of visual field in high myopes is 34.4% for refractive error -6D to -9D and it is 38.9% for myopes of more than -9D refractive error.<sup>11</sup> In our study Visual field in myopes from -6.00DS to -9.00DS was found to be normal, it was constricted in myopes more than

-9.00DS. Brian ward in December 2011 found Colour vision in high myopes is mostly normal but there may be some problem with blue color. In our study, out of 75 subjects, 55 subjects having refractive error from -6.00DS to -12.00DS has normal colour vision. For more than -12.00DS refractive errors color vision was defective in 45% subjects specially for blue color. Stretching of eye ball is the cause of pathologies of fundus which in turn causes diminished visual functions. In our study we aimed to find the effect of pathological myopia on all visual functions and to find most common finding in posterior pole of eye. This was the first study of its kind in Pakistan and so will help in prevention & proper treatment of pathological myopia by guiding the patients regarding the risk factors as well as different management options of pathological myopia.

## CONCLUSION

Pathological myopia causes changes in posterior pole which leads to reduced visual functions. In this study we found that all the Visual functions were reduced in high degree of myopia. Myopic crescent, temporal displacement of disc and posterior staphyloma were most common fundus findings in pathological myopes.

### Recommendations

Genetic counseling should be done to avoid the hereditary causes of pathological myopia, as consanguinity is much more common in Pakistan causing different hereditary diseases like Pathological Myopia. Patients with such myopia should be given low vision aids to monitor all the visual functions tests. More extensive studies should be carried out on large scale to find out the prevalence of pathological myopia causing visual functions defects.

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## REFERENCES

1. Kniestedt C. Visual acuity and its measurement. *British Journal of Ophthalmology*. 2003; 37(11):661-65.
2. Avery RA, Ferner RE, Listernick R, Fisher MJ, Gutmann DH, Liu GT. Visual acuity in children with low grade gliomas of the visual pathway: implications for patient

- care and clinical research. *Journal of neuro-oncology*. 2012;110(1):1-7.
3. Olsen T, Corydon L. Contrast sensitivity as a function of focus in patients with the diffractive multifocal intraocular lens. *Journal of Cataract & Refractive Surgery*. 1990;16(6):703-7.
  4. Powers MK. Paper tools for assessing visual function. *Optometry & Vision Science*. 2009; 86(6):613-18.
  5. Papaconstantinou D, Georgalas I, Kalantzis G, Karmiris E, Koutsandrea C, Diagourtas A, et al. Acquired color vision and visual field defects in patients with ocular hypertension and early glaucoma. *Clinical ophthalmology (Auckland, NZ)*. 2009;3:251-56.
  6. Jacobs GH. Evolution of colour vision in mammals: *Philosophical Transactions of the Royal Society B: Biological Sciences*. 2009; 364(1531):2957-67.
  7. Parede TRR, Torricelli AAM, Mukai A, Vieira Netto M, Bechara SJ. Quality of vision in refractive and cataract surgery, indirect measurers: review article. *Arquivos brasileiros de oftalmologia*. 2013;76(6):386-90.
  8. Aslam TM, Haider D, Murray IJ. Principles of disability glare measurement: an ophthalmological perspective. *Acta Ophthalmologica Scandinavica*. 2007; 85(4):354-60.
  9. Zejmo M, Forminska-Kapuscik M, Pieczara E, Filipek E, Mrukwa Kominek E, Samochowiec-Donocik E, et al. Etiopathogenesis and management of high-degree myopia. Part I. *Medical Science Monitor*. 2009; 15(9):199-202.
  10. Blach R, Jay B, Kolb H. Electrical activity of the eye in high myopia. *British Journal of ophthalmology*. 1966;50(11):629.
  11. Liou SW, Chiu CJ. Myopia and contrast sensitivity function. *Current eye research*. 2001;22(2):81-4.
  12. Neelam K, Ming C et al. *Prog Retina Eye Res*. 2012; 31(5):495-525