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## **Assessment of visual field defects and optic disc changes in patients with high myopia**

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**Abstract**--Glaucoma is a leading cause of global irreversible blindness. Primary open angle glaucoma (POAG) is the most common form of glaucoma and affects 44.1 million individuals worldwide. Furthermore, there is a disproportionate burden of POAG in Asia, with Asians accounting for 53% (23.5 million) of POAG cases worldwide. While early detection of POAG is important in delaying or halting the progression of the disease, a better understanding of the interplay between major risk factors for POAG is crucial. aim of this study is to assess the effects of myopia on POAG in the patient attending MYH Indore OPD (central India). It is a hospital based, prospective, non-randomised case study. 60 eyes of high myopic patients and 60 eyes of general Ophthal OPD patients were evaluated. The statistical software namely SPSS 19.0, were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc. In our study, we found that, in high myopic patient, there were increase in chances of glaucomatous optic disc changes, and these changes were influenced by age and not influenced with gender, degree of myopia. In high myopic patient, there were increase chances

of occurrence of visual field changes. These changes were influenced with age but not influenced with gender, degree of myopia. In high myopic patients, optic disc changes and visual field changes were well correlated. In high myopic patient, intraocular pressure changes were statistically non-significant but risk of developing POAG was higher in those with higher baseline IOP and IOP were influenced with age. Prevalence of primary open angle glaucoma were increase in high myopic patients.

**Keywords**---high myopia, primary open angle glaucoma, optic disc changes, degree of myopia.

## **Introduction**

Glaucoma is a leading cause of global irreversible blindness. Primary open angle glaucoma (POAG) is the most common form of glaucoma and affects 44.1 million individuals worldwide [1]. Furthermore, there is a disproportionate burden of POAG in Asia, with Asians accounting for 53% (23.5 million) of POAG cases worldwide [1,2]. While early detection of POAG is important in delaying or halting the progression of the disease [3,4], a better understanding of the interplay between major risk factors for POAG is crucial [3]. Intraocular pressure (IOP) is an established risk factor for POAG [3,5], and is the only modifiable risk factor for the development and progression of POAG [6,7]. Many previous studies have also reported myopia as another important risk factor for POAG [8,9]. This association is stronger in individuals with moderate-to-high myopia (<-3.00 dioptre) [10-13]. Although IOP and myopia are both closely linked to mechanical strain and deformation of the lamina cribrosa, the inter-relationship between IOP and myopia on the risk of POAG has not been well studied. Most previous studies have evaluated the independent effects of IOP and myopia on POAG, but have not explored the joint effects. This issue is especially important and relevant in East Asians, considering the increasing burden of myopia in this region, and the burden of POAG among Asians compared to other populations [1].

## **Aim and Objectives**

### **Aim**

The aim of this study is to assess the effects of myopia on POAG in the patient attending MYH Indore OPD (central India) and to determine the screening of POAG in high myopics.

### **Objectives**

The objectives of the study include:

- Primary Objectives: To analyse the visual field defect according to ANDERSON RULE in high myopic, using automated perimetry and to analyse the optic disc changes in high myopic, using direct ophthalmoscope, 78D/ 90D.

- Secondary Objectives: to analyse the correct intraocular pressure in high myopic, using applanation tonometry and CCT by specular microscopy and to analyze the anterior chamber angle in high myopic, using goldman three mirror gonioscopy.

## **Materials and Methods**

### **Source of data**

Patients attending the outpatient department of ophthalmology with complaint of diminution of vision in M.Y. Hospital, Indore.

### **Study design**

It is a hospital based, prospective, non-randomised case study.

### **Sample size**

60 eyes of high myopic patients and 60 eyes of general Ophthalmology OPD patients were evaluated.

### **Duration**

1 year from the date of approval from ethical committee.

### **Collection of data**

All patients were outpatients of the hospital. Each patient included in the study undergone history taking and complete ophthalmological examination including:

- Visual acuity measurement by Snellen 's chart.
- Refraction/retinoscopy
- Slit lamp biomicroscopy for anterior segment examination.
- Corrected Intraocular pressure measurement by applanation tonometer and CCT.
- Gonioscopy is done with Goldmann three mirror contact lens. Angle is graded according to Schaffer's grading.
- All eyes are fully dilated and optic nerve head changes are studied stereoscopically at the slit lamp with 90 D/ 78D VOLK Lens and direct ophthalmoscope.
- Visual field defect according to Anderson rule by automated perimetry.

### **Inclusion criteria**

Patients with high myopia (>-6.00D) attending M.Y. Hospital Indore, Patients with high myopia (>-6.0D) having clear media and Patient with age group 40-80 years.

### Exclusion criteria

Patients with evidence of previous ocular surgery (except uneventful cataract surgery), trauma, photocoagulation and cloudy media and Patients with unreliable visual fields (fixation losses >33% or false negative responses >33%) and Patients with vitreous inflammation, retinal vessel occlusion, hypertension, diabetic retinopathy or any other retinal pathology were excluded from the study.

### Statistical software

The statistical software namely SPSS 19.0, were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

### Results

A prospective evaluation study of 60 high myopic patients and 60 general patients attending Ophthalmology OPD was undertaken to study the significance of screening of POAG in high myopic and patient attending Ophthalmology OPD and we evaluated the optic disc changes and visual field changes.

Table 1  
Shows age wise distribution of study population

Age in year	High myopic patient		General Ophthal OPD patient	
	No.	%	No.	%
40-49	14	23.30 %	15	25%
50-59	24	40%	26	43.33%
60-69	16	26.6%	14	23.3%
>70	6	10%	5	8%
TOTAL	60	100%	60	100%
MEAN+SD	51.30+8.88		49.94+-5.71	

This table shows the age wise distribution of patient included in our study. The mean age of high myopic patients group were 51.30+8.88 and in general ophthalmology OPD patients group were 49.94+5.71. It is evident from the table 1 that the mean age in both the groups s are matched, there is significant difference in age between the two groups.

Table 2  
Shows gender wise distribution of study population

Gender	High myopic patients		General Ophthal OPD patients	
	No	%	No	%
Male	38	63.33	34	56.66
Female	22	36.66	26	43.33
Total	60	100.0	60	100.0

This table shows the gender wise distribution of patients included in our study. In high myopic group 63.33% were male and 36.66% were female. In general, ophthalmology OPD patients 56.66% were male and 43.33% were female. It is evident from the table 2 that the both groups are equally matched by Gender, there is significant difference in age between the two groups.

Table 3  
Comparison of optic disc changes in high myopic patients and general ophthalmology OPD patients

Optic disc change	High myopic patients		General Ophthalmology OPD Patients	
	No	%	No	%
Present	9	15%	2	3.66%
Absent	51	85%	58	96.34%
Total	60	100.0	60	100.0

Chi square value – 4.90

P-value – 0.026, significant

Table 3: Optic disc changes between high myopic patients and general Ophthalmology OPD patients compared by using chi square test which was found to be statistically significant ( $P < 0.05$ ).

Table 4  
Age wise distribution of optic disc changes in high myopic patients and general Ophthalmology OPD patients

Age	High myopic patients With ODC	High myopic patients Without ODC	P-value	General OPD patients with ODC	General OPD patients without ODC	P-value
40- 49	2	12		0	15	
50-59	3	21		1	25	
60-69	3	13		1	13	
>70	1	5		0	5	
Mean + SD	2.25±0.957	12.75±6.55	0.0001	0.5±0.77	14.5±8.22	.0202

This table shows, optic disc changes in high myopic patients and general ophthalmology OPD patients in different age group. It was compared by using unpaired t-test, which was found to be statistically significant ( $P < 0.05$ ) significant in both high myopic patients and general OPD patients.

Table 5  
Distribution of optic disc changes based on range of myopia in high myopic patients

Range of myopia	optic disc changes present(n)	optic disc changes absent	Total (N)	n/N%
>- 6Ds to -9Ds	5	28	33	15.15%
>-9Ds to -12Ds	3	14	17	17.6%

>- 12Ds to -15Ds	1	9	10	10%
>- 15Ds	0	0	0	0%

Chi- square: 0.29

P-value: 0.864

Table 5: Optic disc changes between high myopic patients and general Ophthalmology OPD patients compared by using chi square test which was found to be statistically significant ( $P < 0.05$ ).

Table 6

Comparison of positive optic disc parameter among high myopic patients and general ophthalmology OPD patients

ODP	High myopic patients with ODC	High myopic patients without ODC	General OPD patient With ODC	General OPD patient Without ODC
Glaucomatous cupping	8(13.33%)	52	2(3.33%)	58
NRR thinning	7(11.66%)	53	2(3.33%)	58
PPA	3(5%)	57	1(1.66%)	59
Disc haemorrhages	0(0%)	60	0(0%)	60
Vascular changes	2(3.33%)	58	0(0%)	60
Chi square value-	5.67		0.411	
P-value	0.128		0.814	

It is evident from the table 6 that the positive optic disc parameter in high myopic patients and general ophthalmology OPD patients. It was compared by using chi-square test, which was found to be statistically non-significant ( $P > 0.05$ ).

Table 6

Comparison of IOP changes in high myopic patients and general ophthalmology OPD patients

IOP change (>21mmhg)	High myopic patients		General ophthalmology OPD patients	
	No.	%	No.	%
Present	7	11.66%	2	3.66%
Absent	53	88.33%	58	96.34%
Total	60	100.0	60	100.0

Chi square value – 3.00

p-value – 0.083, non-significant

It is evident from the table 6 that the IOP changes in high myopic and ophthalmology OPD patients by using chi-square test, which was shown to be statistically non-significant ( $P > 0.05$ ).

Table 7  
Comparison of visual field indices among high myopic patients and general ophthalmology OPD patients

VF indices	High myopic patients	General ophthalmology OPD patient	Two tailed P value
MD (decibels)	-7.77+1.62	-6.213+1.04	0.0001
PSD (decibels)	2.97+1.68	2.27+1.10	0.008

Visual field indices between high myopic patients and general ophthalmology OPD patients were compared by unpaired t-test, which was found to be statistically significant ( $P < 0.05$ ) in high myopic and general OPD patients.

Table 8  
Comparison of central corneal thickness changes in high myopic patients and general ophthalmology OPD patients

CCT	High myopic patients	General ophthalmology OPD patient
Mean/SD	526.70+12.8	527.7+28.8

z-score: 0.510 P value – 0.610, non-significant

This table shows comparison of central corneal thickness changes between high myopic patients and general ophthalmology OPD patients and was compared by using Z- Score Test which was found to be statistically non-significant ( $P > 0.05$ ).

Table 9  
Distribution of POAG in high myopic and general ophthalmology OPD patient

	disc changes	IOP (>21mmhg)	VF changes	POAG
Present in high myopic patient	9	7	9	9
Absent in high myopic patient	51	53	51	51
Total high myopic patient	60	60	60	60
Present in general OPD patient	2	2	2	2
Absent in general OPD patient	58	58	58	58
Total general OPD patient	60	60	60	60

POAG between high myopic patients and general Ophthalmology OPD patients compared by using Chi-square Test, which found to be statistically significant ( $P < 0.05$ ).

## Discussion

The present study was hospital based, prospective, non-randomized study involving 60 eyes of high myopic patients and 60 eyes of general ophthalmology OPD patients. The study was conducted with aim to screening of primary open angle glaucoma (POAG) in high myopic patients attending MYH Ophthal OPD. The study was conducted for a period of one year. Data for the study was collected from patient attending OPD and glaucoma clinic of MY Hospital Indore. The mean age of high myopic patient group were 51.30±8.88 and in general ophthalmology OPD patient group were 49.94±5.71. The gender wise distribution of patients in high myopic group include 63.33% males and 36.66% females and in general ophthalmology OPD 56.66% males and 43.33% females respectively.

*We compared Optic disc changes between high myopic patients and general OPD patients were compared with Chi-square test which was found to be statistically significant ( $P < 0.05$ ). Gender wise distribution of ODC between high myopic patient and general OPD patient were compared by using chi-square test found to be statistically non-significant ( $P > 0.05$ ). Optic disc changes in high myopic patients and general OPD patients in different age groups of were compared by using Unpaired t-test, which was found to be statistically significant ( $P < 0.05$ ) with p value of 0.0001 in high myopic and 0.020 in ophthal OPD patients respectively. Visual field changes in high myopic patients in different range of myopia was compared by using chi-square test, which was found to be statistically non-significant ( $P > 0.05$ ). Visual field reliable indices between high myopic patients and general OPD patients were compared with Unpaired t-test which was found to be statistically significant ( $P < 0.05$ ). Our findings were found to be consistent with Study by Yi-AnLee, Yung-FengShih et al, Nitta K, Sugiyama K, et al. Study by Yi-AnLeeYung-FengShih et al<sup>14</sup>: they retrospectively studied the influence of myopia on the progression of visual field (VF) loss in primary open-angle glaucoma (POAG) patients. Logistic regression revealed that the deterioration was associated with older age, higher mean intraocular pressure, larger vertical cup-to-disc ratio, and greater myopic refraction status. POAG patients with myopia greater than -6 D had a greater progression of VF loss.*

Study by Nitta K, Sugiyama K, et al<sup>15</sup>: they evaluate the high myopia is risk factor for visual field progression or disk hemorrhage in primary open-angle glaucoma. Highly myopic POAG is considered as a combination of myopic optic neuropathy and glaucomatous optic neuropathy (GON). If GON is predominant, it has frequent DH and more progressive VF loss. However, when the myopic optic neuropathy is predominant, it has less DH and less progressive VF loss. We evaluated Central corneal thickness in high myopic patients was found to be 526.70±12.8 and in general ophthal OPD patient 527.7±28.8. Central corneal thickness between high myopic patients and general OPD patients were compared with Chi-square test which was found to be statistically non-significant ( $P > 0.05$ ). Our findings were found to be consistent with Study by H-B Fam, A C S How et al, Study by Yi-Chun Chen et al. Study by H-B Fam, A C S How, M Baskaran, et al<sup>16</sup> they investigate the association between central corneal thickness (CCT) and the degree of myopia among Chinese. No correlation was found between CCT and the degree of myopia ( $r = -0.13$ ,  $p = 0.719$ ).

We evaluated POAG between high myopic patients and general OPD patients were compared with Chi-square test which was found to be statistically significant ( $P < 0.05$ ). Our findings were found to be consistent with The Blue Mountains Eye Study, the Barbados Eye Study. In the Barbados Eye Study, a myopic refraction was one of several risk factors for POAG in adult black people<sup>[17]</sup>. The Beaver Dam Eye Study showed that, after taking into account the effects of age, sex, and other risk factors, persons with myopia were 60% more likely to have glaucoma than those with emmetropia. In Beijing Eye Study in China, a population study, marked to high myopia with a myopic refractive error exceeding -6 D may be a risk factor associated with glaucomatous optic neuropathy In Asian populations, the Singapore Malays Eye Study showed an association between moderate or high myopia (worse than -4 D) and POAG. Persons with moderate or high myopia had an almost 3 times higher risk of POAG compared with those with emmetropia.

### Conclusion

In our study, we found that, in high myopic patient, there were increase in chances of glaucomatous optic disc changes, and these changes were influenced by age and not influenced with gender, degree of myopia. In high myopic patient, there were increase chances of occurrence of visual field changes. These changes were influence with age but not influenced with gender, degree of myopia. In high myopic patients, optic disc changes and visual field changes were well correlated. In high myopic patient, intraocular pressure changes were statistically non-significant but risk of developing POAG was higher in those with higher baseline IOP and IOP were influenced with age. Prevalence of primary open angle glaucoma were increase in high myopic patients.

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