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Prevalence of Glaucoma among High Myopic Patients

HESHAM F.Sh. TAWFIK, M.Sc.; MOHAMED M. WAHDAN, M.D. and MOHAMED A. RASHED, M.D.

The Department of Ophthalmology, Faculty of Medicine, Al-Azhar University

Abstract

Background: Glaucoma is an optic neuropathy that is characterized by the selective loss of retinal ganglion cells and their axons, which manifests as the loss of the retinal nerve fiber layer (RNFL). Numerous studies have shown that the extent of RNFL damage correlates with the severity of functional deficit in the visual field (VF), and that RNFL measurement by optical coherence tomography (OCT) has good sensitivity for the detection of glaucoma.

Aim of Study: To assess the prevalence of glaucoma among high myopic patients and the association between them using standard automated perimetry (SAP) and optical coherence tomography (OCT).

Patients and Methods: This prospective observational randomized cross sectional study was conducted on 80 eyes of 42 patients with high myopia, in the period from September 2019 to June 2021.

Results: 52.5% of myopic cases were in the right (OD) side and 47.5% were in the left (OS) eye. The mean UCVA and BCVA was 1.07±0.29 and 0.56±0.28 respectively. The mean spherical equivalent (Diopters) was –10.94±4.34. The mean intraocular pressure was 17.85±2.86mm/Hg. The mean vertical cup ratio, mean deviation, pattern SD was 0.51±0.12, –3.42±4.09 and 2.38±1.34 respectively. 47.5% eyes were within normal limits according to Glaucoma hemifield test, 27.5% eyes were outside normal limits, 15% eyes had general reduction of sensitivity and 10% eyes were borderline. The mean average RNFL thickness was 96.45±15.01 meanwhile, the mean Sup. Avg and Inf. Avg. was 100.06±18.13 and 94.87± 15.40 respectively.UNVA, BCVA and Spherical equivalent were significantly higher in glaucoma group compared to non-glaucoma group (p=0.006, 0.004 & 0.01 respectively), while, there was no statistically significant difference between the two groups regarding laterality (p>05).

Conclusion: Glaucoma, the leading cause of irreversible blindness worldwide, can adversely impact quality of life for patients with visual field defects even if they are unaware of their diagnosis. Glaucoma is a group of diseases, and is one of the leading causes of irreversible blindness in the adult population worldwide.

Key Words: *Optical coherence tomography – Standard automated perimetry – Retinal nerve fiber layer – Visual field.*

Correspondence to: Dr. Hesham F.Sh. Tawfik,
E-Mail: heshamfarag989@gmail.com

Introduction

GLAUCOMA is an optic neuropathy that is characterized by the selective loss of retinal ganglion cells and their axons, which manifests as the loss of the retinal nerve fiber layer (RNFL). Numerous studies have shown that the extent of RNFL damage correlates with the severity of functional deficit in the visual field (VF), and that RNFL measurement by optical coherence tomography (OCT) has good sensitivity for the detection of glaucoma **[1]**.

High myopia (6 D or more) is a known risk factor for open angle glaucoma **[2]**.

Previous hospital-based studies and population-based investigations have shown that myopia, in particular high axial myopia, can be a risk factor for glaucomatous optic neuropathy **[3]**.

It has remained unclear, which factors associated with myopia were responsible for the increased susceptibility for glaucomatous optic nerve damage in myopic eyes. Histological studies reported on morphological particularities in eyes with axial high myopia. These features included a thinning and stretching of the lamina cribrosa in the highly myopic secondary macrodiscs (also called megalodiscs), and an elongation and thinning of the peripapillary scleral flange in the parapapillary region of highly myopic optic nerve heads **[4]**.

Clinical diagnosis of glaucoma in this group of patients is often difficult because of the variation in the sizes, shapes, tilt of the optic nerve head, and the presence of large peripapillary atrophy (PPA) in these eyes. In high myopia, RNFL loss also occurs more frequently in a generalized or diffuse pattern rather than in a localized pattern. These characteristics of highly myopic eyes make it difficult to accurately determine the cup-to-disc ratio and the extent of RNFL damage in susceptible patients **[5]**.

An early detection and follow-up of glaucoma require functional testing using standard automated perimetry (SAP) as gold standard, particularly the 24-2 Swedish Interactive Threshold Algorithm (SITA) strategy, as well as structural testing which can be based on ophthalmic findings. But, one of the most reliable methods for objective and precise structural measurements of glaucomatous damage is the optical coherence tomography (OCT) which provides both quantitative and qualitative measurements of the RNFL thickness. OCT in diagnostics of the ONH structural changes became a part of standard procedure for diagnosis and monitoring of patients with retinal pathology. OCT is also highly sensitive in differentiating glaucomatous from non-glaucomatous ONH changes [6].

In addition to retinopathy, increasing levels of myopia is said to increase the risk of a number of other ocular pathologies. The association between glaucoma and myopia has been reported across multiple, large, population-based studies involving many ethnicities with the odds of developing glaucoma rising with increasing myopia. The Blue Mountains Eye Study reported an odds ratio of 2.3 for low myopia and 3.3 for moderate-to-high myopia [7].

The purpose of this study is to assess the prevalence of glaucoma among high myopic patients and the association between them using standard automated perimetry (SAP) and optical coherence tomography (OCT).

Patients and Methods

A prospective observational randomized cross sectional study included a total of 80 eyes with high myopia, in the period from September 2019 to June 2021.

Inclusion criteria:

1- Spherical equivalent refraction 6.0 D or more.

2- Best corrected visual acuity 20/200 or better.

3- A healthy anterior segment appearance on examination with slit-lamp biomicroscopy; open angles at gonioscopy; and reliable visual field (VF) results.

Exclusion criteria:

1- A history of ocular surgery (except for uncomplicated cataract surgery).

2- Other diseases affecting the VFs (e.g., neuro-ophthalmological diseases, or retinal and/or choroidal diseases, trauma).

3- Other disease affecting IOP (e.g. uveitis or pigment desperation syndrome).

Assessment of selected patients:

• *All patients were subjected to:*

1- Medical history taking.

2- Visual acuity assessment using Auto Refractometer, refraction and best corrected visual acuity (B.C.V.A) assessment using Snellen chart and also calculated in Logarithm of Minimum Angle of Resolution (LogMAR).

Table (1): Conversiontable for Snellen's to LogMAR equivalent.

Snellen	LogMAR	Snellen	LogMAR
6/6	0.00	6/48	0.90
6/7.5	0.10	6/60	1.00
6/9.5	0.20	6/90	1.2
6/12	0.30	6/120	1.3
6/15	0.40	6/150	1.4
6/19	0.50	6/180	1.5
6/24	0.60	6/240	1.6
6/30	0.70	6/360	1.8
6/38	0.80	6/480	1.9

3- Slit lamp examination of anterior chamber.

4- Fundus examination (ONH examination) using slit lamp biomicroscopy with +90 Diopter lens.

• *Technique of ONH examination by non-contact slit lamp 90 D lens:*

Measurement of the vertical and horizontal C/D ratios by using slit beam to measure the actual disc size then the diameters was multiplied by correction factor (1.3 for the Volk 90 D), ISNT rule was taken in account in checking for disc rim thinning a full 360 degree. (Since glaucomatous discs tend to present with thinning and/or notching of the inferior and/or superior disc rims).

Sometimes, Green light beam on slit lamp was used to provide clearer view of optic disc border (scleral rim).

The optic disc was viewed and its vessels stereoscopically to assess the extent of the internal rim border. Disc rim sloping or saucerization was noted, which might be an early, subtle sign of damage.

Evaluation of optic disc color, noting if it was pink or pale. (However, focusing solely on the disc color may lead to an underestimation of the C/D ratio, since the cup region is not where the nerve tissue is situated. The tissue in the rim is what becomes thinned in eyes with glaucoma).

Bilateral examination of the optic disc was done to determine any significant asymmetry (Asymmetry of 0.2 or more between the two ONs raises suspicion for possible glaucoma).

Examination of the peripapillary area for atrophy (i.e., the alpha and beta zones), since this finding has been associated with glaucoma and risk for its progression.

Looking for other signs like optic disc hemorrhage which often appear as either splinter or flame-shaped at the edges of the optic disc, their presence often indicate optic neuropathy. They are rare in normal eyes and appear in approximately 4 to 7 percent of glaucomatous eyes.

5- Intraocular pressure measurement by Goldmann applanation tonometer.

6- Angle Assessment by Goniolens.

7- Standard automated perimetry (SAP).

8- Optical coherence tomography (OCT) (RTVue-100 [Optovue]).

Statistical analysis:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric while with non-parametric data were presented as median with inter-quartile range (IQR). Also qualitative data were presented as number and percentages. The comparison between two groups with qualitative data was done by using Chi-square test. The comparison between two independent groups with quantitative data and parametric distribution were done by using Independent *t*-test while with non-parametric data were done by u sing Mann-Whitney test. Logistic regression analysis was done to assess predictors of glaucoma with its odds ratio (OR) and 95% confidence interval (CI). Receiver operating characteristic curve (ROC) was used to assess the best cut off point with its sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and area under curve (AUC).

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: $p>0.05$: Non significant, $p<0.05$: Significant, $p<0.01$: Highly significant.

Results

This table shows that 52.5% of myopic cases were in the right (OD) side and 47.5% were in the left (OS) eye. The mean UCVA and BCVA was 1.07±0.29 and 0.56±0.28 respectively. The mean spherical equivalent (Diopters) was –10.94±4.34.

This table shows that the mean average RNFL thickness was 96.45±15.01. Meanwhile, the mean Sup. Avg and Inf. Avg. was 100.06±18.13 and 94.87±15.40 respectively.

This table shows that UNVA, BCVA and Spherical equivalent were significantly higher in glaucoma group compared to non-glaucoma group (p= 0.006, 0.004 & 0.01 respectively). While, there was no statistically significant difference between the two groups regarding laterality ($p>05$).

Table (2): Distribution of studied eyes regarding clinical characteristics.

Parameters	Studied eyes (n=80)	
	n	%
Laterality:		
OD	42	52.5
OS	38	47.5
UCVA:		
Mean ± SD	1.07±0.29	
Median	1.0	
Range	0.78-1.78	
BCVA:		
Mean ± SD	0.56±0.28	
Median	0.60	
Range	0.18-1.0	
Spherical equivalent (Diopters):		
Mean ± SD	–10.94±4.34	
Median	–9.75	
Range	(–22.0) - (–6.0)	

SD: Standard deviation. UCVA: Uncorrected visual acuity.
N: Number. BCVA: Best corrected visual acuity.
%: Percentage.

Table (3): Distribution of studied eyes regarding RNFL-OCT parameters.

Parameters	Studied eyes (n=80)	
	n	%
Avg. RNFL thickness:		
Mean ± SD	96.45±15.01	
Median	98.31	
Range	59.21-145.12	
Sup. Avg.:		
Mean ± SD	100.06±18.13	
Median	100.28	
Range	58.61-157.62	
Inf. Avg.:		
Mean ± SD	94.87±15.40	
Median	94.69	
Range	59.81-132.64	

Table (4): Relation between presence of glaucoma and different parameters.

	Group (G) (No.=18)		Group (NG) (No.=62)		Test value	*p*-value
	No.	%	No.	%		
Laterality:						
OD	8	44.4	34	54.8	X^2=	0.437
OS	10	55.6	28	45.2	0.604	
UCVA:						
Mean ± SD	1.25±0.30		1.02±0.27		z_{MWU}=	0.006
Median	1.30		1.0		2.76	
Range	0.78-1.78		0.48-1.48			
BCVA:						
Mean ± SD	0.72±0.25		0.51±0.28		z_{MWU}=	0.004
Median	0.78		0.60		2.89	
Range	0.30-1.00		0.18-1.00			
Spherical equivalent (Diopters):						
Mean ± SD	–13.19±4.59		–10.28±4.08		z_{MWU}=	0.010
Median	–12.5		–9.5		2.56	
Range	–22.0-7.0		–22.0-6.0			

*p*0.05 is considered statistically significant.
*p*0.01 i considered h gh statistically significant.
SD=Standard deviation.
*Chi-Square test and Mann-Whitney U test.

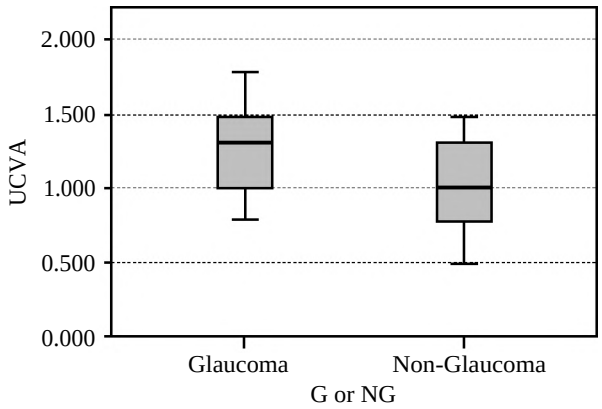

Fig. (1): Box-plot showing difference between the study groups regarding UCVA.

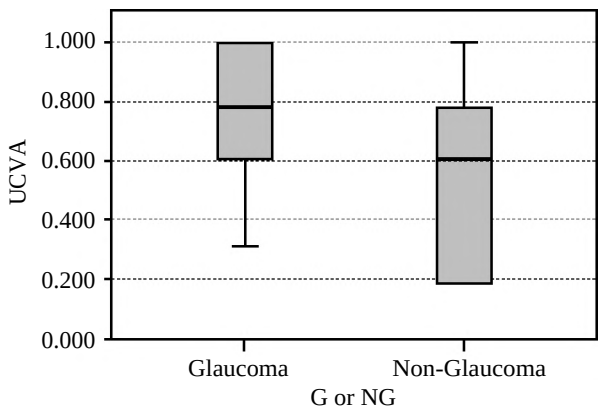

Fig. (2): Box-plot showing difference between the study groups regarding BCVA.

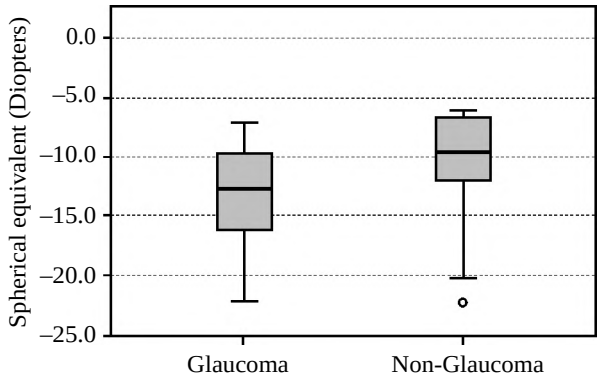

Fig. (3): Box-plot showing difference between the study groups regarding Spherical equivalent.

This table shows that Intraocular pressure and Vertical Cup/Disc ratio were significantly higher in glaucoma group compared to non-glaucoma group (*p*=0.003 & 0.01 respectively). Also, Mean deviation and Pattern standard deviation were significantly higher in glaucoma group compared to non-glaucoma group (*p*=0.001 & 0.001 respectively).

Table (5): Relation between presence of glaucoma and IOP, vertical cup ratio, mean deviation, pattern SD.

	Group (G) (No.=18)	Group (NG) (No.=62)	Test value	*p*-value
Intraocular pressure:				
Mean ± SD	18.67±3.07	17.61±2.78	z_{MWU}=	0.003
Median	18.0	18.0	3.01	
Range	14.0-26.0	12.0-26.0		
Vertical Cup/ Disc ratio:				
Mean ± SD	0.53±0.11	0.51±0.12	z_{MWU}=	0.010
Median	0.55	0.50	2.59	
Range	0.40-0.70	0.30-0.70		
Mean deviation (dB):				
Mean ± SD	–5.93±4.04	–2.69±3.83	z_{MWU}=	0.001
Median	–5.38	–1.34	3.32	
Range	–13.46 - –0.49	–13.46-1.76		
Pattern standard deviation (dB):				
Mean ± SD	3.36±1.61	2.09±1.12	z_{MWU}=	0.001
Median	3.03	1.67	3.22	
Range	1.17-6.38	1.13-5.96		

*p*0.05 is considered statistically significant.
*p*0.01 i considered h gh statistically significant
SD=Standard deviation.
*Mann-Whitney U test.

This table shows that in glaucoma group, 66.7% (12 eyes) outside normal limits, 16.7% (3 eyes) were borderline and 16.7% (3 eyes) were general reduction of sensitivity with statistically significant difference between the two groups regarding Glaucoma hemifield test (*p*<0.001).

Table (6): Comparison between the two studied groups regarding Glaucoma hemifield test.

	Group (G) (No.=18)		Group (NG) (No.=62)		Test value	*p*-value
	No.	%	No.	%		
Glaucoma hemifield test:						
- Border line	3	16.7	5	8.1	X^2=	<0.001
- General reduction of sensitivity	3	16.7	9	14.5	25.06	
- Outside normal limits	12	66.7	10	16.1		
- Within normal limits	0	0.0	38	61.3		

*p*0.05 is considered statistically significant.
*p*0.01 i considered h gh statistically significant
SD=Standard deviation.
*Chi-Square test and Mann-Whitney U test.

Discussion

Glaucoma, the leading cause of irreversible blindness worldwide, can adversely impact quality of life for patients with visual field defects even if they are unaware of their diagnosis. Glaucoma is a group of diseases, and is one of the leading causes of irreversible blindness in the adult population worldwide **[8]**.

Glaucoma is characterized by the loss of retinal nerve fiber tissues, recognized clinically as visual field defect and loss of the neuroretinal rim of the optic nerve head, termed glaucomatous optic neuropathy (GON) **[9]**.

The global prevalence of glaucoma is estimated to be 80 million in 2020. Primary open angle glaucoma (POAG) is a chronic progressive optic neuropathy, direct and convincing evidences for primary mechanisms of glaucoma are still lacking and early detection or predicting progression of POAG remains difficult and challenging **[10]**.

Many studies have investigated and reported risk factors associated with glaucoma. Elevated intraocular pressure (IOP) is a well-known major risk factor for POAG. Evidence shows that lowering IOP reduces the risk of development or slows the progression of glaucoma **[11]**.

In addition, there is growing evidence that other risk factors like age, gender, race, refractive errors, heredity and systemic factors may play a role in glaucoma pathogenesis **[12]**.

Many studies found that high myopia has been associated with POAG. It is possible that myopic individuals may be at increased risk for the development of glaucoma **[13]**. Epidemiologic evidence suggests that high myopia is a risk factor for the development and the progression of glaucomatous optic neuropathy **[10,14]**.

The main aim of this study was to assess the Prevalence of glaucoma among high myopic patients and the association between them using standard automated perimetry (SAP) and optical coherence tomography (OCT).

This prospective observational randomized cross-sectional study included a total of 80 eyes of 44 patients with high myopia attending to Al-Azhar University Hospital, Cairo, for scheduled follow-up. The studied eyes were divided into two groups, 18 cases in Glaucoma group (G-group) and 62 cases in the non-glaucoma group (NG-group).

The main results of this study were as following:

The current study showed that 52.5% of myopic cases were in the right (OD) side and 47.5% were in the left (OS) eye. The mean UCVA and BCVA was 1.07±0.29 and 0.56±0.28 respectively. The mean spherical equivalent (Diopters) was –10.94± 4.34. The mean intraocular pressure was 17.85± 2.86mm/Hg. The mean vertical cup ratio, mean deviation, pattern SD was 0.51±0.12, 3.42±4.09 and 2.38±1.34 respectively. The mean average RNFL thickness was 96.45±15.01. Meanwhile, The mean Sup. Avg and Inf. Avg. was 100.06± 18.13 and 94.87±15.40 respectively. And regarding Glaucoma hemifield test we found that 47.5% eyes were within normal limits according to Glaucoma hemifield test, 27.5% eyes were outside normal limits, 15% eyes had general reduction of sensitivity and 10% eyes were borderline.

In our investigated 80 eyes we found 77.5% of myopic eyes had no glaucoma while 22.5% had glaucoma. We compared the two groups as regard different parameters and found that UNVA, BCVA and Spherical equivalent were significantly higher in glaucoma group compared to non-glaucoma group (p=0.006, 0.004 & 0.01 respectively). While, there was no statistically significant difference between the two groups regarding laterality (p>05).

While the prospective observational study by Park et al., **[15]** aimed to evaluate the relationship between the age at presentation and the rate of glaucoma progression in the visual field (VF) according to the presence of myopia, and found that the Spherical equivalent was higher significantly in glaucoma group then non glaucoma group (p<0.001). While there was no statistically significant difference between the two groups regarding BCVA (p>05).

In line with our study the retrospective cohort study by Lee et al., [16] investigated 369 eyes to evaluate the effect of myopia on the progression of primary open-angle glaucoma and found that the Spherical equivalent was higher significantly in glaucoma group then non glaucoma group (p< 0.001).

Our results were further supported by Chansangpetch et al., [17] who evaluated the impact of myopia on corneal biomechanical properties in primary open-angle glaucoma (POAG) and nonglaucoma patients and reported that the Spherical equivalent was higher significantly in glaucoma group then non glaucoma group (p<0.05), while there was no statistically significant difference between the two groups regarding laterality (p>05).

Our results showed that Intraocular pressure and Vertical Cup/Disc ratio were significantly higher in glaucoma group compared to non-glaucoma group (p=0.003 & 0.01 respectively). Also, mean deviation and Pattern standard deviation were significantly higher in glaucoma group compared to non-glaucoma group (p=0.001 & 0.001 respectively).

This was in agreement with the study by Abd El Kader et al., [18] who reported that vertical cup/disc ratio, mean deviation, pattern standard deviation all are highly significant with a p-value <0.01, intraocular pressure is significant with a p-value <0.05.

Also, in harmony with our results the study by Chang et al., [5] reported that intraocular pressure, vertical cup/disc ratio, Visual field mean deviation, and Visual field pattern standard deviation in addition to Visual field index all are highly significant with a p-value <0.001.

While in contrast the study by Park et al., [15] revealed that there was no statistically significant difference between the glaucoma and non-glaucoma groups regarding Baseline untreated IOP, mean treated IOP, Baseline visual field mean deviation and Baseline visual field pattern standard deviation (p>05). As well the study by Lee et al., [16] revealed that there was no statistically significant difference between the glaucoma and non-glaucoma groups regarding Baseline IOP and Baseline visual field mean deviation (p>05). Also, in contrast to our results Chansangpetch et al., [17] revealed that there was no statistically significant difference between the glaucoma and non-glaucoma groups regarding IOP and visual field mean deviation (p>05).

As regard RNFL-OCT parameters comparison between the studied groups, we found that the Avg. RNFL thickness was significantly lower in glaucoma group compared to non-glaucoma group (p= 0.003). Also, Sup. Avg and Inf. Avg. were significantly lower in glaucoma group compared to non-glaucoma group (p=0.001 & <0.001 respectively).

This comes in agreement with the study by Abd El Kader et al., [18] who reported that the effect of glaucoma on RNFL thickness in their study group with a highly significant p-value <0.01 with average thickness mean (Avg. RNFL) 86.37, average superior thickness mean (Sup. Avg) 90.06 and average inferior thickness mean (Inf. Avg.) 82.68.

As well the study by Lee et al., [16] revealed that there was statistically significant difference between the glaucoma and non-glaucoma groups regarding Baseline RNFL thickness (p=0.043).

Furthermore, our results were supported by Chang et al., [5] who reported that the thickness of various cpRNFL (circumpapillary retinal nerve fiber layer) parameters significantly differed between the control and glaucoma eyes.

While in contrast to this the study by Park et al., [15] revealed that there was no statistically significant difference between the glaucoma and non-glaucoma groups regarding Average RNFL thickness (p=0.308).

Logistic regression analysis for factors predicting of glaucoma revealed that there was statistically significant association between superior avg. with occurrence of glaucoma. There was no statistically significant association between occurrence of glaucoma and UCVA, BCVA, spherical equivalent (Diopters), intraocular pressure, Vertical Cup/Disc ratio, Mean deviation (dB), pattern standard deviation (dB), Avg. RNFL thickness (p>0.05) and Inf. Avg. (p>0.05).

However, the study by Park et al., [15] revealed that for the entire group, the presence of disc hemorrhage (3=0.231; 95% confidence intervals (CI), 0.373 to 0.089; p= 0.026) was the only related parameter. In the myopic group, age (3=0.417; 95% CI, 0.651 to 0.200; p=0.050) and baseline untreated IOP during the follow-up period (3=0.179; 95% CI, 0.331 to 0.028; p=0.022) were significantly related to the rate of MD change, based on multivariate analyses (Table 3). In the nonmyopic group, only disc hemorrhage (3=0.335; 95% CI, 0.568 to 0.018; p=0.022) was related to the rate of MD change in the multivariate analysis.

Lee et al., **[16]** reported that when visual field was used as a progression criterion, thinner baseline RNFL (hazard ratio [HR]: 0.942, $p<0.001$) was predictive of progression. When optic disc/ RNFL photographs were used, worse baseline visual field mean deviation (VF MD) and thinner RNFL were associated. The HMG category was a preventive factor for optic disc/RNFL photographic progression (HR: 0.323, $p=0.031$).

Using the ROC curve analysis revealed that UCVA can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 61.1%, 66.1%, 64.3% and 62.95% ($p=0.003$). BCVA can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 66.7%, 72.6%, 70.9% and 68.6% ($p<0.001$). spherical equivalent can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 61.1 %, 72.6%, 69.0% and 65.1 % ($p=0.003$). Intraocular pressure can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 55.6%, 80.6%, 74.1% and 64.5% ($p=0.001$). Vertical Cup/Disc ratio can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 66.7%, 77.4%, 74.7% and 69.9% ($p=0.012$). Mean deviation (dB) can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 94.4%, 50.0%, 65.4% and 89.9% ($p<0.001$). Pattern standard deviation (dB) can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 83.3%, 75.8%, 77.5% and 81.9% ($p=0.001$). Avg. RNFL thickness can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 77.8%, 67.7%, 70.7% and 75.3% ($p<0.001$). Sup. Avg can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 72.2%, 75.8%, 74.9% and 73.2% ($p<0.001$). Inf. Avg can significantly detect glaucoma in myopic patients with sensitivity, specificity, PPV and NPV of 83.3%, 79%, 79.9% and 82.6% ($p<0.001$).

All of these parameters can be used in detecting Glaucoma with the superiority of Inf. Avg. as it has the biggest AUC and sensitivity specificity.

Our results were supported by Abd El Kader et al., **[18]** who reported that Patients with high pattern standard deviation (cut-off point >2.02) are exposed to glaucoma with AUCs 93.1, sensitivity 88.24 and specificity 100.00. Patients with low inf. RNFL thickness (cut-off point 88.68) are exposed to glaucoma with AUCs 91.3, sensitivity 76.47 and specificity 95.65. Patients with low mean deviation (cut-off point –136) are exposed to tc glaucoma with AUCs 87.3, sensitivity 94.12 and specificity 65.22. Patients with low average RNFL thickness (cutoff point 90) are exposed to g aucoma with AUCs 85.5, sensitivity 70.59 and specificity 91.30. Patients with high BCVA (cut-off point >0.78) are exposed to glaucoma with AUCs 81.7, sensitivity 64.71 and specificity 84.78. Patients with low sup. RNFL thickness (cut-off point 96.8) are exposed to g aucoma with AUCs 775, sensitivity 70.59 and specificity 78.26. Patients with high UCVA (cut-off point >1) are exposed to glaucoma with AUCs 74.7, sensitivity 58.82 and specificity 73.91. Patients with high vertical cup/ disc ratio (cutoff point >0.5) are exposed to glaucoma with AUCs 65.5, sensitivity 52.94 and specificity 78.26. Patients with low spherical equivalent (cut-off point –12) are exposed to g aucoma with AUCs 68.5, sensitivity 52.94 and specificity 78.26. Patients with low intraocular pressure (cut-off point > 18) are exposed to glaucoma with AUCs 64.7, sensitivity 47.06 and specificity 86.96. But with the superiority of Pattern standard deviation.

Chang et al., 2020 reported that the AUROC of each cpRNFL parameter was compared between RS-3000 and Cirrus HD-OCT. The best cpRNFL parameter for glaucoma assessment was the average RNFL (AUROC=0.899, 95% CI, 0.824-0.973) of the RS-3000, and the RNFL at clock-hour 7 (AUROC=0.912, 95% CI, 0.850-0.973) of the Cirrus HD, respectively.

Conclusion:

The present study showed that there was statistically significant association between superior avg. with occurrence of glaucoma. We also found that UCVA, BCVA, spherical equivalent (Diopters), intraocular pressure, Vertical Cup/Disc ratio, Mean deviation (dB), pattern standard deviation (dB), Avg. RNFL thickness, Sup. Avg and Inf. Avg can be used to discriminate glaucoma from non-glaucoma eyes with the superiority of Inf. Avg according to the area under the ROC-curve analysis. Further studies with large sample sizes are needed to strength the present results and remove any conflicts between literature.

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انتشار المياه الزرقاء بين مرضى قصر النظر الشديد

خلفية البحث: الجلوكوما هو اعتلال عصبى بصرى يتميز بالفقدان الانتقائى لخلايا العقدة الشبكية ومحاورها العصبية، والذى يتجلى فى فقدان طبقة الألياف العصبية الشبكية (RNFL). أظهرت العديد من الدراسات أن مدى تلف RNFL برتبط بشدة العجز الوظيفى فى المجال البصرى (VF)، وأن قياس RNFL بواسطة التصوير المقطعى البصرى (OCT) لديه حساسية جيدة للكشف عن الجلوكوما.

الهدف من البحث: تقييم مدى ظهور الجلوكوما بين مرضى قصر النظر المرتفع والارتباط بينهم باستخدام مقياس محيط آلى قياسى والتصوير المقطعى البصرى (OCT).

المرضى وطرق البحث: أجريت هذه الدراسة المقطعية المستعرضة العشوائية القائمة على الملاحظة على عيناً لـ ٤٢ مريضاً يعانون من قصر نظر مرتفع فى الفترة من سبتمبر ٢٠١٩ إلى يونيو ٢٠٢١.

نتائج البحث: ٥٢.٥٪ من حالات قصر النظر كانت فى الجانب الأيمن و ٤٧.٥٪ كانت فى العين اليسرى. كان متوسط UCVA و ١.٠٧±٠.٢٩ BCVA و ٠.٢٨±٠.٦٥ على التوالى. كان متوسط المكافئ الكروى (الديوبتر) −١٠.٩٤±٤.٣٤، كان متوسط ضغط العين ١٧.٨٥±٢.٨٦ مم / زئبق. كان متوسط نسبة الكأس العمودية، متوسط الانحراف، نمط ٠.١٢±٠.٥١ SD، ٤.٠٩±٣.٤٢− و ٢.٣٨±١.٣٤ على التوالى. كانت نسبة ٤٧.٥٪ من العيون ضمن الحدود الطبيعية وفقاً لاختبار الجلوكوما hemifield، و ٢٧.٥٪ كانت العيون خارج الحدود الطبيعية، و ١٥٪ كان لديها إنخفاض عام فى فى الحساسية و ١٠٪ كانت عيون حدية. كان متوسط سمك ١٥٠.١±٩٦.٤٥ RNFL. فى غضون ذلك، يعنى Sup. متوسط و Inf. متوسط كان ١٠٠.٠٦±١٨.١٣ و ٩٤.٨٧±١٥.٤٠ على التوالى. كان كل من UCVA و BCVA والمكافئ الكروى أعلى بشكل ملحوظ فى مجموعة الجلوكوما مقارنة بمجموعة غير الجلوكوما (٠.٠٠٠٦=p، و ٠.٠١ على التوالى). بينما لم يكن هناك فرق ذو دلالة إحصائية بين المجموعتين فيما يتعلق بالاتجاه الجانبى (p<٠٥).

الاستنتاج: ممكن أن يؤثر الجلوكوما، وهو السبب الرئيسى للعمى الدائم فى جميع أنحاء العالم، سلباً على نوعية حياة المرضى الذين يعانون من عيوب فى المجال البصرى حتى لو لم يكونوا على دراية بتشخيصهم. الجلوكوما عبارة عن مجموعة من الأمراض، وهى أحد الأسباب الرئيسية للعمى الذى لا يمكن علاجه لدى البالغين فى جميع أنحاء العالم.