

Burden of glaucoma: adjunct eye diseases

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ABSTRACT

Purpose: The purpose of this study was to better understand the broad impact of primary open-angle glaucoma (POAG) by identifying eye conditions commonly associated with this multifactorial disease.

Methods: An IRB-approved retrospective chart study was conducted at a major academic institution. A total of 713 ethnically diverse patients met the inclusion criteria: 411 were diagnosed with POAG and 302 were controls with no glaucoma diagnosis. Information was collected on: demographics, refractive errors, and ocular ailments. Cochran-Mantel-Haenszel tests were used to compare eye disease prevalence between the two groups.

Results: The POAG group (mean age: 64.3, SD=13.3) was 44% female and the control group (mean age: 64.8, SD=12.3) was 47% female. The POAG group showed a higher prevalence of astigmatism (80% vs 60%, p<0.0001), myopia (66% vs 54%, p=0.0004), legal blindness (4.6% vs 1%,p= 0.004), pseudophakia (43% vs 35%, p=0.01), blepharitis (18% vs 12%, p=0.006), retinal detachment (4.1% vs 1.3%, p=0.03), central retinal vein occlusion (CRVO) (3.4% vs 0%, p=0.001), ptosis (12% v 4%, p=0.0001), and uveitis (2.4% vs 0.3%, p=0.02).

Discussion: The POAG group had an increased prevalence of astigmatism, myopia, legal blindness, pseudophakia, blepharitis, retinal detachment, CRVO, ptosis, and uveitis. Some of these results are explainable and expected. Glaucoma is the second leading cause of legal blindness in the United States. In addition, myopes have an increased risk of POAG and retinal detachment compared to emmetropes. The increased prevalence of blepharitis is likely due to side-effects of glaucoma medications. Another side effect is an increased risk of cataracts, which may explain the increased prevalence of pseudophakia. Lastly, glaucoma is a known risk factor for CRVO. The results involving uveitis and ptosis are more difficult to explain.

Conclusions: This study has shown that patients with POAG have a host of other ocular diseases that may affect their quality of life. Awareness of these associations and their causes would be invaluable to clinicians as they screen for and treat ocular diseases. Future work to replicate the findings of this study and the elucidation of potential mechanisms underlying these associations are indicated.

INTRODUCTION

Primary open-angle glaucoma (POAG) is one of the leading causes of blindness across the globe and affects an estimated 3 million people in the United States₂. POAG is multifactorial and has many risk factors including increased age, high intraocular pressure, and a positive family history. Open angle glaucoma often has an insidious onset and is characterized by a progressive loss of optic nerve fiber and visual field deterioration. The purpose of this study was to access the broad impact of the disease on patients by identifying eye conditions commonly associated with POAG.

MATERIALS AND METHODS

This retrospective study received approval by the University of Texas Southwestern and VA Medical Center Institutional Review Boards. Charts of patients with POAG at the UT Southwestern James W. Aston Ambulatory Care Center and the VA Medical Center Eye clinic were reviewed. Data was collected using a collection form and subsequently entered into a database for storage. Patients with incomplete or insufficient records were excluded from the study.

The data collection form for the study is shown below. First, demographic information was collected. Next, charts were reviewed for the presence or absence of a glaucoma diagnosis. Refractive errors were considered based on a patient's refraction information from eye clinic visits. A bifocal power greater than +1 diopter was categorized as presbyopia. Similarly, patients with a cylinder greater than 1.00 was considered to have astigmatism, a refraction greater than +1.00 diopter was used for hyperopia, and a refraction of less than -1.00 was used for myopia.

Finally, charts were thoroughly reviewed for the presence or absence of a variety of eye conditions: amblyopia, legal blindness, cataract, pseudophakia, Fuchs' dystrophy, diabetic retinopathy, dry eyes, ARMD, macular edema, macular hole, epiretinal membrane, retinal detachment, posterior vitreous detachment (PVD), central retina vein occlusion (CRVO), dermatochalasis, blepharitis, lid ptosis, uveitis, and eye trauma.

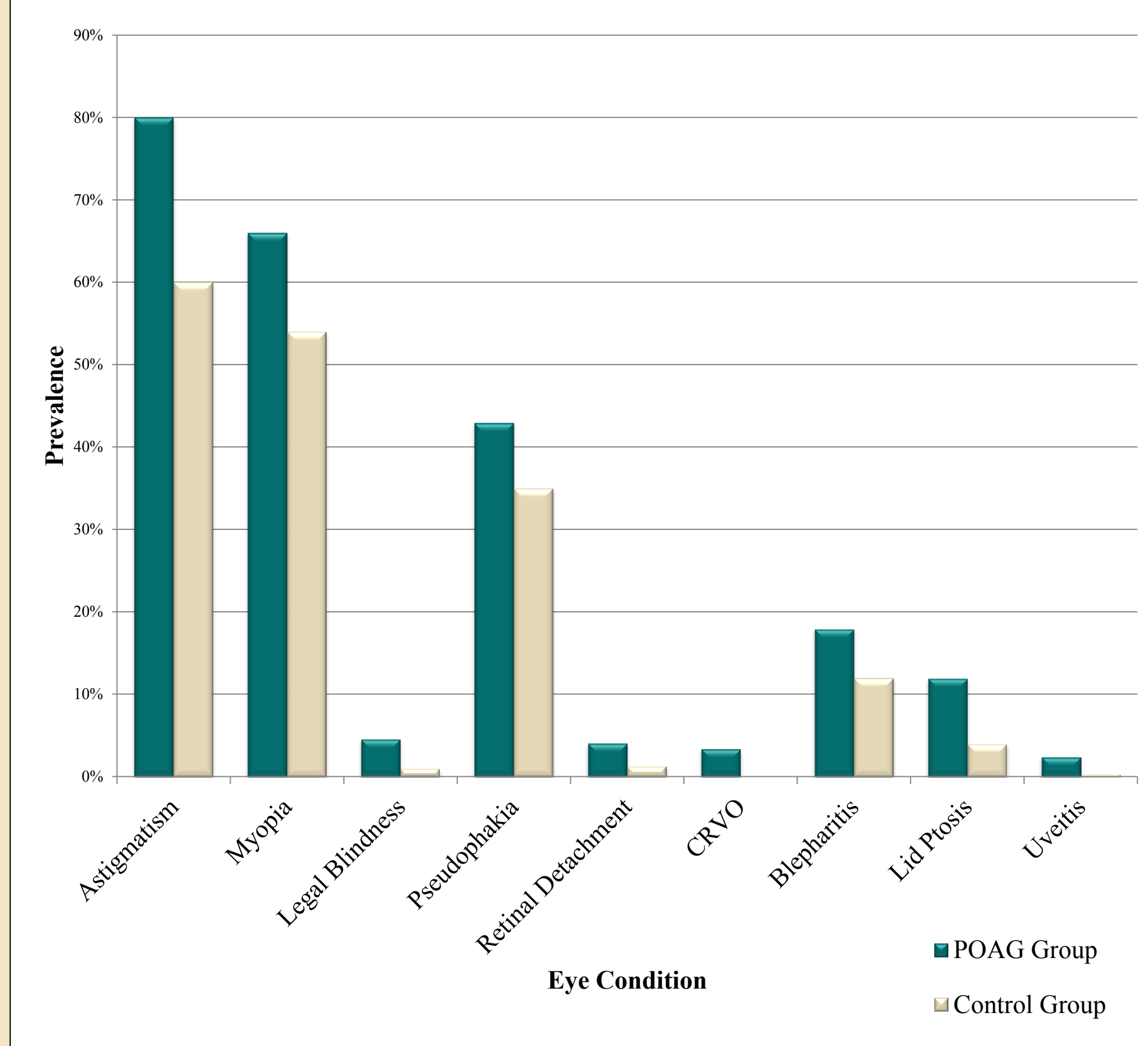
Patients were placed into two groups based on their glaucoma diagnosis: POAG and non-POAG (control). A total of 713 ethnically diverse, age-matched patients qualified for the study: 411 were diagnosed with POAG and 302 were controls with no glaucoma diagnosis. Cochran-Mantel-Haenszel tests, stratified by hospital, were used to compare eye disease prevalence between the two groups.

DATA COLLECTION FORM

Demographic Information	Study ID: _____
DOB (mm/dd/year): ____/____/____	
Gender: (0/1) (0= Male 1 = Female)	
Race (0/1/2/3/4/5) (0= White 1= Black 2= Hispanic 3= Asian 4= East Indian 5 = other)	
BMI: _____	
Glaucoma information	
Glaucoma diagnosis: OD:(0/1/2/3/4) OS:(0/1/2/3/4) (0=no glaucoma 1= POAG 2=LTG/NTG 3= suspect 4= other)	
Date of diagnosis or clinic visit with eye note: ____/____/____	

Burden of Glaucoma Adjunct Diseases		
Refractive errors:		
A. Presbyopia (> +1.00 D):	(no yes unknown)	
B. Astigmatism (>1.00 Cyl):	(no yes unknown)	
C. Hyperopia (>+1.00 D):	(no yes unknown)	
D. Myopia (> -1.00 D):	(no yes unknown)	
Amblyopia	(yes/no)	
Legal blindness	(yes/no)	
Cataract	(yes/no)	
Pseudophakia	(yes/no)	
Fuchs' dystrophy	(yes/no)	
Diabetic retinopathy	(yes/no)	
Dry eyes	(yes/no)	
ARMD		
A. Dry ARMD	(yes/no)	
B. Wet ARMD	(yes/no)	
Macular edema	(yes/no)	
Macular hole	(yes/no)	
Epiretinal membrane	(yes/no)	
Retinal detachment	(yes/no)	
PVD	(yes/no)	
Central retinal vein occlusion	(yes/no)	
Dermatochalasis	(yes/no)	
Blepharitis	(yes/no)	
Lid ptosis	(yes/no)	
Uveitis	(yes/no)	
Eye trauma (blunt)	(yes/no)	
Other: _____		

RESULTS



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Eye Condition	POAG	Control	P-Value
Presbyopia	81%	86%	0.12
Astigmatism	80%	60%	<0.0001*
Hyperopia	32%	29%	0.38
Myopia	66%	54%	0.0004*
Amblyopia	1%	2%	0.8215
Legal Blindness	5%	1%	0.004*
Cataracts	73%	67%	0.0567
Pseudophakia	43%	35%	0.01*
Fuchs' Dystrophy	3%	2%	0.666
Diabetic Retinopathy	11%	10%	0.7949
Dry Eyes	27%	24%	0.3489
ARMD-Dry	10%	11%	0.7994
ARMD-Wet	1%	1%	0.7963
Macular Edema	4%	3%	0.5154
Macular Hole	1%	3%	0.1404
Epiretinal Membrane	4%	5%	0.8992
Retinal Detachment	4%	1%	0.03*
PVD	6%	12%	0.7579
CRVO	3%	0%	0.001*
Dermatochalasis	12%	9%	0.1165
Blepharitis	18%	12%	0.006*
Lid Ptosis	12%	4%	0.0001*
Uveitis	2%	0%	0.02*
Eye Trauma	4%	2%	0.2572

RESULTS

Data was compiled and analyzed for a total of 713 patients: 411 in the POAG group and 302 in the control group. The POAG group had a mean age of 64.3 (SD=13.3) and was 44% female. The control group had a mean age of 64.8 (SD=12.3) and was 47% female.

Several eye conditions showed a higher prevalence in the POAG group relative to the control group. 80% of patients with POAG had astigmatism compared to 60% of the control patients (p<0.0001). Myopia was also found to be more prevalent in the POAG group: myopia was found in 66% of the POAG group and 54% of the control group (p=0.0004). Legal blindness was present in 4.6% of the patients with POAG versus 1% of the control group (p=0.004). 43% of the POAG group had pseudophakia compared to 35% of the control group (p=0.01).

Blepharitis was also more prevalent in the POAG group; 18% of the POAG group had blepharitis versus 12% of the control patients (p=0.006). Retinal detachment was found in 4.1% of glaucoma patients and 1.3% of the control group (p=0.03). Patients with POAG also had a higher prevalence of CRVO: 3.4% compared to 0% of control patients (p=0.001). Ptosis was more prevalent as well, and it was found 12% of the POAG group and 4% of the control group (p=0.0001). Lastly, uveitis was found in 2.4% of patients with POAG compared to 0.3% of control patients (p=0.02). The prevalence of these conditions for both groups is depicted in Figure 1.

For each of the other eye conditions investigated, there was no statistically significant difference found for the condition's prevalence between the POAG and control groups. These conditions included presbyopia, hyperopia, amblyopia, cataracts, Fuchs' Dystrophy, diabetic retinopathy, dry eyes, ARMD, macular edema, macular hope, epiretinal membrane, PVD, and eye trauma. The prevalences and p-value for each condition is tabulated in Figure 2.

CONCLUSION

The POAG group had a higher prevalence of astigmatism, myopia, legal blindness, pseudophakia, blepharitis, retinal detachment, CRVO, ptosis, and uveitis. Some of these results are more readily explainable than others. Legal blindness is expected, because glaucoma is the second leading cause of blindness in the world₂. Myopia is an established risk factor for POAG and also retinal detachment₄. Therefore, the association of POAG and retinal detachment may be a secondary association related to myopia.

The side effects of medications commonly prescribed for POAG may partly explain the association of POAG with blepharitis and cataracts₁. This explains the association of POAG with pseudophakia. Cataracts should similarly be expected to have a significant association; however, in this study, the p-value was just above the threshold for statistical significance. Finally, glaucoma is a known risk factor for central retinal vein obstruction₄. The results involving astigmatism, uveitis, and ptosis are not as easily accounted for; however, these associations may still be related to glaucoma medications.

Summary:

- Patients with POAG have a number of other ocular conditions that may affect their quality of life.
- Awareness of these associations may be invaluable to clinicians as the screen for a treat ocular disease.
- Future work to replicate these findings and the elucidation of mechanisms underlying these associations are indicated.

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ACKNOWLEDGEMENTS

- Supported in part by an unrestricted grant from the Research to Prevent Blindness, New York, NY.
- Supported in part by NIH Core Grant EY020799.