

Clinical and epidemiological characteristics of patients with primary closed-angle glaucoma

Yanelis Morales Alcolea^{1,*}, Ludmila Pérez Castillo², Frank Antonio Sánchez Boloy¹, María Gisela Cabrera Naranjo³

1. Dr. Juan Bruno Zayas Alfonso Teaching General Hospital. Santiago de Cuba, Cuba

2. Saturnino Lora Provincial Clinical-Surgical Teaching Hospital. Santiago de Cuba, Cuba

3. Dr. Orlando Pantoja Clinical-Surgical Hospital. Contramaestre. Santiago de Cuba, Cuba

*Corresponding author.

Email address: yanelismoralesalcolea@gmail.com

Abstract: Introduction: Blindness constitutes a health problem worldwide; its main cause is glaucoma. The patient with this clinical entity has a 3 times higher risk of presenting serious bilateral visual disability. Objective: To describe some epidemiologic and clinical aspects of patients with primary closed-angle glaucoma. Method: A descriptive, cross-sectional and prospective study was carried out with 20 people over 40 years with primary closed-angle glaucoma who went to the emergency room of Dr. Juan Bruno Zayas Alfonso Teaching General Hospital in Santiago de Cuba, from September, 2020 to the same period in 2022. Results: In the series there was a prevalence of the 60-69 age group (45.0%) and females (75%). Half of the patients (50.0%) presented visual acuteness in the range lower than 0.1 and papillary excavation higher than 0.7. Conclusions: Primary closed-angle glaucoma is still a health problem; its serious consequences, like the abrupt decrease of vision that can cause irreversible damage to the optic nerve due to the severe ocular hypertension, impose a true challenge for the ophthalmologist in his daily work. The opportune and appropriate treatment of these patients will avoid the deterioration of visual function.

Key words: blindness; glaucoma; visual acuteness; ocular hypertension

1 Introduction

Blindness is a global health problem; there are approximately 28 million people with this disability, but 75% of these cases could be prevented. Glaucoma is a widespread disease in all countries. There is a broad group of conditions whose common feature is an increase in intraocular pressure beyond the eye's protective capacity.

According to the World Health Organization, glaucoma is the second leading cause of blindness worldwide, after cataracts, but unlike cataracts, it leads to irreversible vision loss and affects about 3% of the global population. Currently, 16 million people worldwide are affected by this disease, and 4 million of them are blind in both eyes. When all age groups are taken into account, the prevalence is approximately 1.5% of the total population, a figure that rises to 3–4% among those over 40 years of age [1].

Primary closed-angle glaucoma (PACG) is a disease that can lead to vision loss and remains a global health issue. This condition is an ophthalmological emergency and is associated with high rates of visual morbidity.

It is worth noting that in 90% of patients, there are anatomical and physiological conditions that predispose them to

pupillary block, such as a small corneal diameter, a thicker convex iris with impaired compensatory mechanisms during mydriasis, and a forward-positioned lens with marked curvature or increased thickness in an eye with a shorter axial length and a shallow anterior chamber, which affects the balance between the contents and the container. Once pupillary block occurs, the aqueous humor accumulated in the posterior chamber pushes the iris forward and positions it against the trabecular meshwork. In 10% of patients, it is the anterior rotation of the ciliary body or an increase in its thickness or size that elevates the root of the iris into apposition against the trabecular meshwork. In recent years, the influence of the morphofunctional changes that occur in the iris during mydriasis has gained importance [2].

The classification used in recent publications and validated by the International Society of Geographical and Epidemiological Ophthalmology (ISGEO) is the one proposed by Foster in 2002. This includes the following categories: suspected primary angle-closure (PACS), primary angle-closure (PAC), and PACG [3]. PACS is diagnosed when more than 270° of the posterior trabecular meshwork is not visible due to apposition of the iris periphery. The rest of the ophthalmic examination is normal. In PACG, narrow-angle glaucoma is associated with glaucomatous changes in the optic disc. Primary angle-closure is diagnosed in the presence of angle-closure accompanied by ocular hypertension or signs such as glaucomflecken, iris atrophy, and peripheral anterior synechiae, among others suggestive of prior ocular hypertension. The acute presentation is known as acute primary angle-closure (APAC) [4,5]

Primary closed-angle glaucoma (PACG) is a condition in which elevated intraocular pressure (IOP) occurs as a result of obstruction of aqueous humor drainage, caused by partial or complete closure of the angle by the peripheral iris. In contrast, in primary open-angle glaucoma (POAG), the diagnosis depends largely on examination of the anterior segment and careful gonioscopy. The presence of a normal optic nerve head and the absence of visual field loss do not rule out a diagnosis of POAG. The disease occurs in anatomically predisposed eyes and is often bilateral, although the acute form typically presents unilaterally [1,6,7].

It is estimated that approximately 22% of PACS cases in Asian patients will progress to PAC within 5 years, and 28% of these will present with primary closed-angle glaucoma.

Because this is a condition that threatens vision, if this condition is suspected, the patient should be referred to a specialist immediately for inpatient treatment [8]. The choice of appropriate therapy will take into account the pathophysiological factors involved and the clinical presentation at the time of diagnosis [2]. Despite new technologies (ultrasonic biomicroscopy, Scheimpflug imaging, and optical coherence tomography of the anterior segment) with their undeniable advantages—since some even allow for quantitative measurements—gonioscopy remains the gold standard for evaluating the anatomy of the angle, due to its availability and ease of use [4].

Given the high incidence of this disease in the global population and the large number of patients presenting to emergency departments for this condition, as well as its impact on quality of life and its biopsychosocial implications for those affected due to its dramatic sequelae—which lead to a guarded visual prognosis—this study was conducted with the aim of describing certain epidemiological and clinical aspects of patients with primary closed-angle glaucoma treated at the Santiago de Cuba Ophthalmology Center.

2 Methods

A descriptive, cross-sectional, and prospective study was conducted from September 2020 through the same period in 2022. The study population and sample consisted of 20 individuals over 40 years of age with primary angle-closure glaucoma who presented to the Emergency Department of the Dr. Juan Bruno Zayas Alfonso Teaching General Hospital in Santiago de Cuba.

In accordance with bioethical and legal requirements, authorization to conduct this study was requested from the

relevant academic authorities at the aforementioned hospital, and the confidentiality and integrity of the data obtained were maintained.

All patients underwent a thorough interview and a complete ophthalmological examination. A data collection form was used to record variables of interest, such as age, sex, skin color, history of ocular pathology, type of angle-closure glaucoma, best-corrected visual acuity (BCVA), intraocular pressure, fundus abnormalities, visual field, and treatment administered.

The data were processed using computerized methods, and percentages were used as summary measures for analysis.

3 Results

Table 1 shows that the 60–69 age group was the most common, with 9 patients (45.0%). There were more female patients than male patients, with 15 (75.0%); thus, for every 3 affected women, there was one man, at a ratio of 3:1.

Table 1. Patients by age and sex

Age	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
40 – 49			2	10.0	2	10.0
50 – 59	1	5.0	3	15.0	4	20.0
60 – 69	3	15.0	6	30.0	9	45.0
70 and older	1	5.0	4	20.0	5	25.0
Total	5	25.0	15	75.0	20	100.0

With regard to skin color, 10 patients (50.0%) were of mixed race.

Table 2 shows the types of angle-closure glaucoma, with acute congestive glaucoma being the most common, affecting 9 patients (45.0%).

Table 2. Patients by type of angle-closure glaucoma

Type of angle-closure glaucoma	No.	%
Acute congestive	9	45.0
Post-congestive	5	25.0
Chronic	4	20.0
Intermittent	1	5.0
Absolute	1	5.0
Total	20	100.0

As shown in Table 3, BCVA was found to be less than 0.1 in 10 patients (50.0%), followed by the range of 0.1 to 0.7 in 9 patients (45.0%).

Table 3. Patients by best-corrected visual acuity and fundus abnormalities

Fundus abnormalities (cup-to-disc ratio)								
BCVA	0.1 – 0.3		0.4 – 0.6		0.7 – 1.0		Total	
	No.	%	No.	%	No.	%	No.	%
Less than 0.1			2	10.0	8	40.0	10	50.0
0.1 – 0.7	3	15.0	4	20.0	2	10.0	9	45.0
0.8 – 1.0	1	5.0					1	5.0
Total	4	20.0	6	30.0	10	50.0	20	100.0

As shown in Table 4, intraocular pressure was elevated or high in most patients (19 out of 95.0%).

Table 4. Patients by intraocular pressure and treatment received

Intraocular pressure	Treatment received					
	Medical treatment		Laser iridectomy		Filtering surgery	
	No.	%	No.	%	No.	%
Normal			1	5.0		
Elevated	9	45.0	9	45.0		
High	10	50.0	10	50.0	5	25.0
Total	19	95.0	19	95.0	5	25.0

4 Discussion

Among the most common types of glaucoma is primary angle-closure glaucoma, which ranks second. It is a major cause of vision loss; it is considered a particularly frustrating eye disease, making treatment for those affected a real challenge.

It is worth noting that in this cohort, females outnumbered males, a finding consistent with studies conducted in India by Sihota et al.[6], who found that the onset of the condition in most patients occurred after the age of 60, with females being the most affected. In another study conducted in Brazil by Leal et al.[5] on associated factors, no significant differences were found with respect to gender. In contrast, a study on the sociodemographic characteristics of patients with glaucoma revealed a higher prevalence among those aged 45 to 50 and among women, a finding that aligns with this series regarding gender, though not with respect to age [1].

Generally, primary angle-closure glaucoma is much more common in people over 60 years of age. In all developed countries, an increase in the incidence and prevalence of this disease is anticipated due to declining birth rates and increased life expectancy in the population.

On the other hand, in terms of skin color, mixed-race patients were the most common. Previous studies do not align with these findings; among them is the study conducted in Nigeria by Omoti and Enock [7], who found that primary angle-closure glaucoma is rare in black individuals and that the incidence is higher in white individuals. Another study, such as that by Phu et al.[8] on age-related changes in the anterior chamber by gender and ethnicity, found a predominance among women of mixed-race descent, which coincides with the results of this case series.

Regarding the prevalence of acute angle-closure glaucoma, this occurs because patients generally do not pay attention to the early signs of the disease and visit the ophthalmologist only when symptoms of the acute episode appear, as they are so painful. It is a vision-threatening emergency that results in painful vision loss due to the sudden and complete closure of

the angle.

Visual acuity refers to the visual system's ability to clearly distinguish details at a specific distance and under specific conditions. It is measured using optotypes that the individual must identify; one of the best-known and most widely used is the Snellen chart. Measuring best-corrected visual acuity (BCVA) is essential, as it accurately indicates the patient's visual function.

In this study, best-corrected visual acuity was below 0.7 in 95.0% of patients. These results differ from those reported by Chen and Lin [9], who found visual acuity between 0.4 and 0.7 in the majority of patients in their series. Vision loss due to glaucoma is permanent, but it can be prevented through early detection and immediate management of the disease [1].

Regarding fundus abnormalities, papillary excavation greater than 0.7 was the most common finding in 50.0% of cases, accounting for half of all patients studied; these were the patients with visual acuity less than 0.1. This result is consistent with the findings of other authors [10].

Early diagnosis by an ophthalmologist to initiate the correct treatment and establish the most appropriate follow-up guidelines is the most effective way to prevent the serious consequences of the disease. This requires an ophthalmological examination that includes systematic measurement of intraocular pressure (IOP), as well as visual field testing [4,11].

Intraocular pressure readings were elevated in most patients, which is consistent with the study by Thomas et al.[12], who suggested that sustained elevated intraocular pressure leads to significantly greater damage to the optic nerve fibers. Upon examination of the other eye, normal intraocular pressure readings were found in all patients in the series. Even if IOP is reduced, the disease may progress in up to 25% of patients.

It is important to note that both the diagnosis and treatment of patients with chronic primary angle-closure glaucoma pose a challenge, since this condition does not present with a florid or acute clinical picture, and when patients present to the emergency department, they already have severe lesions with a poor visual prognosis.

With regard to treatment, most patients received a combination of therapies. The most commonly used were medication (95%) and laser iridotomy, which was performed in 100% of the cases. Filtration surgery was performed in only 25% of patients with elevated intraocular pressure. Intravenous carbonic anhydrase inhibitors (acetazolamide) were used due to their faster onset of action and the presence of nausea. Hyperosmolar agents to reduce intraocular pressure are almost always used as a last resort because of the high risk of cardiovascular side effects they produce.

Topical steroids such as prednisolone (1% every 4 hours) were also used, as they are very effective in controlling the intraocular inflammation that typically accompanies this condition; miotics (pilocarpine) help alleviate the attack by moving the peripheral portion of the iris away from the trabecular meshwork. When the pupillary sphincter is typically ischemic due to IOP greater than 40 or 50 mmHg, it does not respond to miotics until the pressure is reduced by other means [2].

Laser iridotomy in acute primary angle-closure glaucoma should be performed after the hypertensive crisis has been controlled, once mydriasis and corneal edema have resolved; furthermore, it should be performed within the first 24 hours on the fellow eye, as the risk of a similar event is 50–75% over the next 5 years.

Similarly, trabeculectomy is reserved for eyes with recurrent or prolonged angle closure associated with extensive peripheral anterior synechiae, elevated IOP that does not respond to medical treatment or laser procedures, or advanced glaucomatous damage. Filtration surgery as an initial treatment is not successful due to the high incidence of complications in an inflamed eye and the risk of failure due to fibrosis, atalamia, choroidal detachment, cataract, and hyphema, among others.

In general, these patients had associated conditions, including: hypertension, diabetes mellitus, hyperlipidemia, peptic

ulcer, as well as other vascular disorders, confirming the influence of vascular factors associated with glaucoma on the damage and progression of optic nerve lesions; hence the importance of a comprehensive evaluation and assessment of the patient [10,13,14,15].

In short, maintaining quality of life by slowing the progression of visual field loss over time is an important part of patient care. Acute primary angle-closure glaucoma remains a health problem; its serious consequences, such as sudden vision loss that can cause irreversible damage to the optic nerve due to severe ocular hypertension, pose a real challenge for ophthalmologists in their daily practice. Timely and appropriate treatment of patients with this disease prevents visual function from being impaired.

It is recommended that the provincial health system facilitate collaboration between primary care ophthalmologists and general practitioners to prevent acute primary angle-closure glaucoma in all patients with risk factors.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Farfán Feijoo AP, López Rivadeneira FR, López Rivadeneira RJ, Navia Aray RA. Factores de riesgo asociado a glaucoma en pacientes de 40 a 65 años, hospital IEES Portoviejo. RECIAMUC.2022;6(1):72-84.
- [2] Fernández Argones L, Piloto Díaz I, Díaz Águila Y, Obret Mendive I, Ferrer Guerra MT, Álvarez Cisneros G. Consideraciones terapéuticas en el cierre angular primario. Rev. cuba. oftalmol. 2012[citado 12/07/2023];25. Disponible en: https://revoftalmologia.sld.cu/index.php/oftalmologia/article/view/136/html_85.
- [3] Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. Br J Ophthalmol. 2002;86(2):238-42.
- [4] Ríos Torres M, Fernández Argones L, Hernández Silva JR, Ramos López M. Oftalmología. Diagnóstico y tratamiento. 2 ed. La Habana: ECIMED; 2018. p .111-4.
- [5] Leal BC, Medeiros FA, Oliveira BF Telles de, Pinheiro A, Susanna Junior R, Kara Jose N. Fatores associados ao conhecimento de glaucoma numa população de hospital terciário. Rev. Bras. oftalmol. 2001;60(8):556-62.
- [6] Sihota R, Ghate D, Mohan S, Gupta V, Pandey RM, Dada T. Study of biometric parameters in family members of primary angle closure glaucoma patients. Eye(Lond). 2008;22(4):521-7.
- [7] Omoti AE, Enock ME. Glaucomatocyclitic crisis in Edo State, Nigeria: report of two cases. Niger J Clin Pract. 2008;11(2):162-5.
- [8] Phu J, Tong J, Zangerl B, Le JL, Kalloniatis M. Cluster analysis reveals patterns of age-related change in anterior chamber depth for gender and ethnicity: clinical implications. Ophthalmic Physiol Opt. 2020;40(5):632-49.
- [9] Chen HY, Lin CL. Comparison of medical comorbidity between patients with primary angle-closure glaucoma and a control cohort: a population-based study from Taiwan. BMJ Open. 2019;9(3):e024209.
- [10] Gil Martínez T, Brazón ME, Cedeño OR, Cáceres A. Variación de la presión intraocular y medidas cuantitativas del segmento anterior pre y postiridotomía en pacientes sospechosos de cierre angular primario. Rev Mex Oftalmol. 2019;93(1):14-8.
- [11] Qiu L, Yan Y, Wu L. Appositional angle closure and conversion of primary angle closure into glaucoma after laser peripheral iridotomy. Br J Ophthalmol. 2020;104:386-91.
- [12] Thomas R, George R, Parikh R, Muliyl J, Jacob A. Five year risk of progression of primary angle closure suspects to primary angle closure: a population based study. Br J Ophthalmol. 2003;87(4):450-4.
- [13] Arcaya Canqui JZ. Hallazgos gonioscopicos del ángulo camerular en pacientes con diabetes mellitus tipo II que

acuden al Servicio de Oftalmología por consulta externa del Hospital Cayetano Heredia de mayo del 2022 a abril del año 2023 [tesis]. Lima: Universidad peruana Cayetano Heredia, Facultad de medicina; 2022[citado 12/07/2023]. Disponible en: https://repositorio.upch.edu.pe/bitstream/handle/20.500.12866/11627/Hallazgos_ArcayaCanqui_Jeanneth.pdf?sequence=1&isAllowed=y.

[14] Antonova N, Dersu II, Burstein E, Lyons L, Hou W. The prevalence of diabetes among male glaucoma patients. *Pan-American Journal of Ophthalmology*. 2020; 2(1):31.

[15] Gedde SJ, Chen PP, Muir KW, Wright MM, Li T, Mansberger SL. Primary Angle-Closure Disease, Preferred Practice Pattern®. *Ophthalmology*. 2021;128(1):30-70.