Research Article

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Epidemiological and Clinical Aspects of Patients with Blindness Following From Primary Open-Angle Glaucoma at the University Hospital Center of Ouémé-Plateau, Benin

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ABSTRACT

***Introduction**: The authors studied the epidemiological and clinical aspects of blindness in primary open-angle glaucoma (POAG) at the Departmental University Hospital Center of Ouémé-Plateau (CHUD-OP).*

***Method**: This descriptive and analytical cross-sectional observational study was carried out in the ophthalmology department of CHUD-OP in Porto-Novo over a period of five years. The population included all patients with unilateral or bilateral blindness related to primary open-angle glaucoma (POAG).*

***Results**: Among the 34,565 patients seen in consultation during the study period, 483 patients were followed for POAG, among whom 104 presented blindness. The frequency of POAG was 1.40%, with a prevalence of blindness linked to POAG of 21.53%, including 16.15% for unilateral damage and 5.38% for bilateral damage. The average age of the patients was 62.78 ± 13.17 years, with a majority of patients without a history (58.65%) and a notable proportion of arterial hypertension (16.35%). Visual loss was the main reason for consultation (47.12%), with an unspecified consultation delay in more than half of the patients. Sociodemographic, clinical and therapeutic data did not show a significant association with blindness.*

***Conclusion**: POAG-related blindness remains a major challenge in ophthalmology, highlighting the importance of early detection for its prevention and effective management.*

Keywords

Primary open-angle glaucoma, Blindness, Porto-Novo, Benin.

Introduction

Primary open-angle glaucoma (POAG) is a progressive degenerative optic neuropathy characterized by an insidious disappearance of retinal ganglion cells and their axons which constitute the optic nerve with an open iridocorneal angle associated with an alteration of the visual field [1]. It is a global scale pathology, constituting, after cataract, the second cause of blindness in the world and the first cause of irreversible blindness [2].

Blindness is defined by the World Health Organization as visual acuity less than 1/20th or a corresponding loss of visual field (reduced to less than 10°) for best correction [3]. It constitutes a public health problem in developing countries and particularly in sub-Saharan Africa [4].

In 2013, the number of people (aged 40 to 80 years) with glaucoma worldwide was estimated at 64.3 million, increasing to 76 million in 2020 and will reach 111.8 million in 2040. It is an asymptomatic disease whose diagnosis is often established in Africa at the stage of blindness, due to lack of early detection [5]. In Africa, glaucoma represents 15% of the causes of blindness with a higher prevalence compared to other regions in the world.

In Cameroon, the prevalence of bilateral and monocular blindness due to glaucoma is 8% and 32.9% of glaucoma patients, respectively [6].

In Benin, POAG is current and occupies an important place in ophthalmology consultations. Its prevalence in 2008 is 5.5% [7]. According to a prevalence survey and search for causes of severe visual impairment carried out in 1990, it represents 15% of cases of bilateral blindness, 3.4% of bilateral visual loss and 4% of unilateral blindness [8].

Although glaucoma is irreversible, there are treatment options through which the progression of the disease can be delayed. These methods include medical and/or surgical treatment. Rapid diagnosis and strict adherence to treatment are necessary for the successful management of glaucoma. This worrying situation led us to initiate this study, the objective of which was to study the risk factors associated with blindness from POAG at CHUD-OP.

Study Method

Our study was carried out in the ophthalmology department of the Departmental University Hospital Center of Ouémé-Plateau (CHUD-OP). This was a descriptive and analytical cross-sectional observational study, over a period of five (05) years, from January 1, 2016 to December 31, 2020. The population consisted of all patients with unilateral blindness or bilateral linked to POAG with the following mentions: glaucomatous optic disc and visual acuity (VA) <1/20th for at least one eye and presence of blindness in the context of medical follow-up for POAG. The sampling was exhaustive, systematically including all the files of patients admitted during the study period.

The dependent variable was blindness related to POAG and the explanatory variables concerned sociodemographic, clinical and therapeutic characteristics.

Data collection was carried out from the consultation register, patients' medical files and individual processing sheets designed for this purpose. They were coded and entered into an input mask created with Excel software. Data analysis was carried out using Epi info 7.2 software. The Odd Ratio was the measure of association used, followed by its 95% confidence interval. The differences were considered significant at the 5% threshold.

Results

» Epidemiological Aspects

- **Blindness frequency**

During the study period, 34,565 patients were seen in consultation, among whom 483 patients were followed for POAG, 104 of whom presented blindness. The frequency of POAG in our study was 1.40%.

The prevalence of blindness linked to POAG in our series was 21.53% including 16.15% for unilateral damage and 5.38% for bilateral damage.

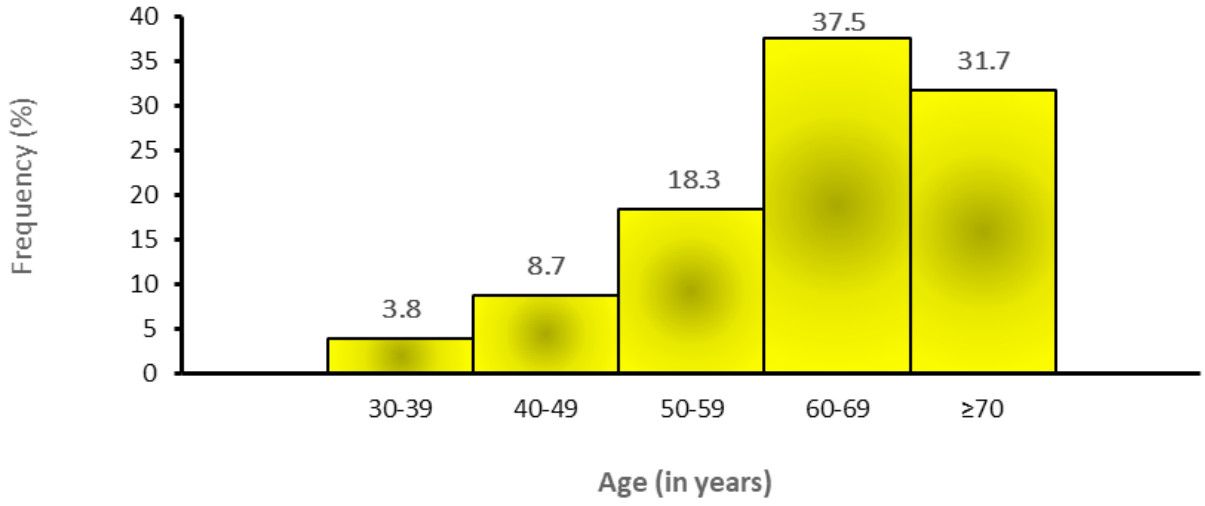
◊ Sociodemographic characteristics

» **Age**

The average age of the patients was 62.78 ± 13.17 years with extremes of 32 and 94 years. The following figure illustrates the distribution of patients according to age groups (CHUD-OP, 2021).

» **Gender**

The male gender was predominant: 73.03%, with a gender ratio of 2.71%.



Clinical Aspects

Patients with no history represented 58.65%. Arterial hypertension was found in 16.35% of cases. Visual loss was the main reason for consultation (47.12%). The consultation time was not specified in 54 patients, or 51.92%. The onset of symptoms before the first consultation was more than 12 months ago for 26.92% of patients.

Table 2: Distribution of patients by clinical aspects (CHUD-OP 2021, n=104).

	n	%
History		
No history	61	58.65
HT	17	16.35
Family glaucoma	13	12.50
Family blindness	8	7.69
Diabetes	3	2.88
Phacoexeresis	2	1.92
Reasons for consultation		
Visual loss	49	47.12
Headache + visual loss	23	22.12
Follow-up	20	19.23
Eye pain	08	7.68
Fundus	04	3.85
Consultation time (in months)		
< 1	2	1.93
1 – 12	20	19.23
> 12	28	26.92
Unknown	54	51.92

Factors Influencing Blindness in Primary Open Angle Glaucoma

◊ Sociodemographic factors

Tables 3 and 4 present the relationship between sociodemographic and clinical factors.

Table 3: Distribution of sociodemographic factors associated with blindness (CHUD-OP 2021. n=104).

	N	Blindness		RP	IC $_{95\%}$	P-Value
		Yes n (%)	No n (%)			
Age (in years)						
30-39	19	4 (21.05)	15 (78.95)	1		
40-49	42	9 (21.43)	33 (78.57)	1.01	0.35 – 2.89	0.9735
50-59	88	19 (21.59)	69 (78.41)	1.02	0.39 – 2.67	0.9588
60-69	181	39 (21.55)	142 (78.45)	1.02	0.41 – 2.55	0.9603
≥70	153	33 (21.57)	120 (78.43)	1.02	0.40 – 2.57	0.9589
Gender						
Male	353	76 (21.53)	277 (78.47)	1		
Female	130	28 (21.54)	102 (78.46)	1.00	0.68 – 1.46	0.9984

Table 5 represents the relation between therapeutic factors associated with blindness.

Table 4: Distribution of sociodemographic factors associated with blindness (CHUD-OP 2021, n=104).

	N	Blindness		RP	IC $_{95\%}$	P-Value
		Yes n (%)	No n (%)			
History						
HT	79	17 (21.52)	62 (78.48)	1.00	0.58 – 1.72	0.9958
Diabetes	14	3 (21.43)	11 (78.57)	0.99	0.35 – 2.81	0.9946
Phacoexeresis	9	2 (22.22)	7 (77.78)	1.03	0.29 – 3.62	0.9568
Family glaucoma	60	13 (21.67)	47 (78.33)	1.01	0.56 – 1.79	0.9700
Family blindness	38	8 (21.05)	30 (78.95)	0.97	0.49 – 1.92	0.9407
Consultation time (in months)						
<1 month	9	2 (22.22)	7 (77.78)	1.94	0.55 – 6.79	0.2975
1-12 month	162	20 (12.35)	142 (87.65)	1.09	0.64 – 1.86	0.7281
>12 month	258	28 (10.85)	230 (89.15)	0.84	0.49 – 1.42	0.5244
Intraocular pressure						
Right eye						
≤ 21 mmHg	186	40 (21.51)	146 (78.49)	1		
> 21 mmHg	297	64 (21.55)	233 (78.45)	1.00	0.70 – 1.42	0.9910
Œil gauche						
≤ 21 mmHg	265	57 (21.51)	208 (78.49)	1		
> 21 mmHg	218	47 (21.56)	171 (78.44)	1.00	0.71 – 1.41	0.9893

Table 5: Distribution of therapeutic data associated with blindness (CHUD-OP 2021, n=104).

	N	Blindness		RP	IC $_{95\%}$	P-Value
		Yes n (%)	No n (%)			
Treatment regimens						
Monotherapy	218	47 (21.56)	171 (78.44)	1.00	0.71 – 1.41	0.9893
Dual therapy	251	54 (21.51)	197 (78.49)	0.99	0.71 – 1.40	0.9919
Triple therapy	14	3 (21.43)	11 (78.57)	0.99	0.35 – 2.75	0.9924
Follow-up frequency						
Regular	153	33 (21.57)	120 (78.43)	1		
Irregular	330	71 (21.52)	259 (78.48)	0.99	0.69 – 1.43	0.9894

Discussion

At The Epidemiological Level

» Frequency

The prevalence of primary open-angle glaucoma (POAG) in our study was 1.40%, which is consistent with similar findings previously reported. This frequency is close to that observed by

Gbé et al. [9] in Ivory Coast in 2017 (1.4%) and by Sounouvou et al. [10] in Benin in 2013 (1.5%). However, it differs notably from the results obtained by Dohvoma et al. [11] in Cameroon in 2018 (0.92%) and by Kyari et al. [4] in Nigeria in 2015 (30.5%). These variations might be attributed to differences in the sampling methodologies used in different studies.

Our study also revealed a prevalence of blindness associated with POAG of 21.53%, a value that is within the range of previously reported results. Assavèdo et al. [12] in Benin and Vijaya et al. [13] in India found similar prevalences of POAG-related blindness, reinforcing the consistency of results across studies conducted in different geographic settings.

Early detection and effective management of POAG are essential to prevent disease progression and reduce the risk of blindness. The results of our study highlight the importance of continuing surveillance and screening efforts for POAG in at-risk populations, in order to identify and treat cases of the disease early. This could help reduce the prevalence of blindness associated with POAG and improve long-term visual outcomes for patients with this condition.

» Sociodemographic aspects

- **Age**

The mean age of patients was 62.78 ± 13.7 years, with a range of 32 to 94 years. This average is consistent with that reported by Al-Najmi et al. [14] in Saudi Arabia in 2019 which is 62.2 ± 18 years and by Olushola et al. [15] in Nigeria in 2016 which is also 61.9 ± 19.5 years. On the other hand, Dohvoma et al. [11] in Cameroon in 2018 found an average age of 49.1 ± 19.55 years. The age group of 60 to 69 years was the most represented, with the majority of patients (37.5%), which is in agreement with the trends observed in other studies where people aged 60 to 69 years and those over 70 years of age are more likely to experience blindness related to open-angle glaucoma (POAG).

The results of our study regarding the average age of patients are consistent with those reported in other geographic contexts, which reinforces the validity of our observations. Advanced age is a well-established risk factor for the development of POAG and the occurrence of associated blindness. Previous studies have consistently demonstrated an increase in the prevalence of POAG-related blindness with age, highlighting the importance of monitoring and caring for older adults to prevent vision loss.

The concentration of POAG-related blindness in the 60 to 69 age group highlights the importance of targeting this population for early detection and effective management of glaucoma. Healthcare professionals should be alert to the signs and symptoms of POAG in older patients and should encourage regular screening to detect the disease at an early stage. Additionally, appropriate preventive and therapeutic interventions should be implemented to reduce the risk of blindness in these patients.

Differences in mean ages across studies could be attributed to variations in the demographic and epidemiological characteristics of the study populations, as well as data collection methodologies. It is essential to take these differences into account when interpreting the results and to formulate recommendations adapted to each context to optimize the prevention and management of POAG and associated blindness.

- **Gender**

The observed gender ratio was 2.71, indicating a clear male predominance in our sample. This trend is consistent with the results of Dohvoma et al. [11] in Cameroon, who reported a sex ratio of 1.5. In the majority of studies examining the prevalence of open-angle glaucoma (POAG), a higher prevalence in men has been reported, as observed in 84.4% of cases. However, studies such as those conducted by Vijaya et al. [13] in China and Al-Najmi et al. [14] in Saudi Arabia in 2019 noted a female predominance in 57.6% and 57.3% of cases respectively. These disparities in gender distribution could be influenced by sociodemographic factors and methodological variations between studies.

The male predominance in the prevalence of POAG is a widely documented phenomenon, but the precise reasons behind this trend are not fully elucidated. Biological, hormonal, and behavioral factors could contribute to this disparity. For example, some studies suggest that men may be more likely to develop POAG due to hormonal factors or differences in lifestyle habits such as smoking.

Observed differences in gender distribution between studies could reflect variations in the demographic and epidemiological characteristics of the study populations, as well as in data collection methodologies. Cultural and environmental differences between regions might also play a role in the prevalence and clinical presentation of POAG in men and women.

Understanding the factors underlying the male predominance in POAG is essential to guide efforts to prevent, screen for, and manage the disease. Particular attention should be paid to raising awareness and educating men about the risks of POAG, as well as promoting healthy lifestyles to reduce these risks. Additional studies are needed to comprehensively examine the gender determinants of POAG and to develop targeted interventions to reduce gender disparities in the prevalence and management of this disease [16].

From The Clinical Standpoint

» History

The majority of patients, i.e. 58.65%, had no history. However, among the antecedents found, high blood pressure (hypertension) predominated (16.35%).

Al-Najmi et al. [14] in 2019, Saudi Arabia, reported that hypertension and diabetes were the most common general pathologies in 52.8% and 59.7% of cases respectively and no history of familial glaucoma was found. This could be explained by the fact that vascular factors cause hypoperfusion of the optic nerve and progressive destruction of retinal ganglion cells.

» **Reason for consultation**

Visual loss was the main reason for consultation in 47.12% of cases. This observation could be explained by the fact that the patients were already at an advanced stage before diagnosis; visual acuity being most often preserved at the beginning.

» **Consultation delay**

Patients who consulted more than a year after the onset of symptoms represented 26.92%. The consultation deadline was not specified in 51.92% of cases. This could be explained by the fact that it is an insidious disease, silent because it is asymptomatic.

Factors Influencing Blindness in Primary Open Angle Glaucoma

» **Sociodemographic factors**

No statistically significant association was observed between socio-demographic factors such as age, gender and occupation, and the occurrence of blindness in our study. These results are in line with those of Vijaya et al. [13] in China, who also reported no significant association between gender and occupation and blindness. However, other studies have reported variable associations between these factors and blindness, highlighting the complexity of the determinants of this condition. While our study did not identify a significant association between age and blindness, other research has found a strong link between older age and increased risk of blindness. This is the case of Kyari et al. [4] in Nigeria who reported that subjects aged 70 to 79 years had a higher risk of blindness. Similarly, Katibeh et al. [17] in Iran noted a significantly higher prevalence of blindness in older individuals. These results highlight the importance of taking age into account as a major risk factor in assessing the risk of blindness in glaucoma.

Although our study did not find a significant link between gender and blindness, previous research has reported conflicting results. For example, Katibeh et al. [17] observed a significant association between female sex and an increased prevalence of blindness. However, other studies, such as that conducted by Kyari et al. [4], reported a more marked influence of the male gender on the occurrence of blindness. These differences could be attributed to variations in demographic characteristics and risk factors specific to each study population.

The variability of the results observed in our study and in the literature highlights the complexity of the determinants of blindness in glaucoma. In addition to socio-demographic factors, other variables such as genetic characteristics, lifestyle habits, access to health care and the quality of care can also influence the risk of blindness. Therefore, a holistic approach taking into account all these factors is essential to better understand and prevent blindness in glaucoma.

» **Clinical factors**

The finding that medical history such as hypertension (HT), diabetes, phacoexeresis, family glaucoma and family blindness, as well as consultation delay and intraocular pressure (IOP), do not significantly influence the occurrence of blindness, raises several important reflections.

First, these results may indicate increased complexity in the risk factors associated with glaucoma-related blindness. While some previous studies have suggested links between these medical histories and the occurrence of blindness in glaucoma, our results do not appear to support this association. This raises the possibility that other factors not explored in this study, such as genetics, treatment adherence, or other comorbidities, might play a greater role in the development of blindness in these patients.

Secondly, the absence of a significant effect of consultation delay on the occurrence of blindness highlights the importance of early awareness and glaucoma screening. Although early diagnosis and treatment are crucial to prevent disease progression and reduce the risk of blindness, our results suggest that other factors may also influence the prognosis of glaucoma patients. This highlights the importance of more effective screening strategies and awareness programs to encourage early glaucoma diagnosis and appropriate disease management.

Finally, the lack of association between intraocular pressure and the occurrence of blindness may be surprising given the well-established role of IOP elevation in the development and progression of glaucoma. However, this could reflect the complexity of the relationship between IOP and disease progression, as well as the importance of other risk factors, such as genetic susceptibility or optic nerve sensitivity. These results highlight the importance of a holistic approach in the assessment and management of glaucoma, taking into account multiple risk factors and clinical parameters to optimize patient outcomes.

» **Therapeutic factors**

The impact of treatment regimen and frequency of follow-up visits on the development of blindness in primary open-angle glaucoma was examined in our study. We did not observe a significant association between these factors and the occurrence of blindness in the patients studied. These results can be discussed taking into account the advanced stage of the disease in the majority of participants at the time of their inclusion in the study. Furthermore, evidence suggests that regularity of follow-up visits and medication adherence are crucial elements in the management of glaucoma, but their direct impact on the prevention of blindness remains subject to debate.

It is well documented that blindness in glaucoma is often the result of undetected or uncontrolled progression of the disease. In our study, the majority of patients already had an advanced stage of glaucoma at the time of their inclusion. This characteristic of the sample could partly explain the lack of association between treatment regimen or frequency of follow-up visits and blindness. At this late stage, damage to the optic nerve may be irreversible, limiting the effectiveness of therapeutic interventions to prevent progression to blindness.

Although our study did not find a direct link between medication adherence and blindness, it is crucial to highlight its role in the long-term management of glaucoma. Previous studies have shown that adherence to medications and follow-up visits is a key determinant of disease progression and preservation of visual function. Therefore, although our study could not demonstrate this association, it is essential to promote medication adherence to optimize clinical outcomes in glaucoma patients.

It is also important to note that studies on the impact of the therapeutic regimen and the frequency of follow-up visits for blindness in glaucoma are not unanimous. Previous work has reported conflicting results, suggesting that other factors, such as quality of care, genetic characteristics, and surgical interventions, may also play a role in preventing blindness in patients with glaucoma. Therefore, further research is needed to better understand the determinants of blindness in glaucoma and to develop more effective prevention strategies.

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