



Original article

Prevalence and Treatment of Glaucoma in Sub-Saharan Africa: The Case of Guinea

Prévalence et traitement du glaucome en Afrique Subsaharienne, le cas de la Guinée

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Résumé

Buts : Evaluer la prévalence du glaucome chez les patients du CADES0 et en décrire la prise en charge.

Méthodologie : Il s'agit d'une étude prospective transversale descriptive d'une durée de 03 mois allant du 20 Octobre 2021 au 19 Janvier 2022.

Résultats : La prévalence du glaucome était de 7,9% avec une prédominance masculine (58,4%). La tranche de 60 a 69 ans était la plus atteinte avec une moyenne d'âge de 57,29 +/- 17,06 ans. La fréquence du GPAO était de 91,8%. Les principaux traitements prescrits aux patients diagnostiqués étaient médicamenteux (90,7%), physique (8,6%) et chirurgical (6%). Les classes thérapeutiques les plus représentées étaient les BB (75,1%). Le timolol était la molécule la plus prescrite (72,5%).

Conclusion : La vulgarisation des moyens diagnostiques et thérapeutiques permettrait de prévenir/traiter le glaucome le plus précocement possible ainsi que ses complications.

Mots-clés : Glaucome, prévalence, combinaisons thérapeutiques, classes thérapeutiques.

Abstract

Purpose: To evaluate the prevalence of glaucoma in CADES0 patients and to describe its management.

Methodology: This is a prospective descriptive cross-sectional study of 3 months duration from October 20, 2021 to January 19, 2022.

Results: The prevalence of glaucoma was 7.9% with a male predominance (58.4%). The 60 to 69 years old age group was the most affected with an average age of 57.29 +/- 17.06 years. The frequency of POAG was 91.8%. The main treatments prescribed to the diagnosed patients were medication (90.7%), physical (8.6%) and surgical (6%). The most represented therapeutic classes were BBs (75.1%). Timolol was the most prescribed molecule (72.5%).

Conclusion: The popularization of diagnostic and therapeutic means would allow the prevention/treatment of glaucoma and its complications as early as possible.

Keywords: Glaucoma, prevalence, therapeutic combinations, therapeutic classes..

Introduction

Glaucoma is a group of progressive optic neuropathies characterized by degeneration of retinal ganglion cells, resulting in optic neuropathy and enlargement of the optic disc excavation, which manifest as concordant visual field deficits [1].

It combines vascular, genetic, anatomical, and immune risk factors [2].

Glaucoma can be primary or secondary and is subdivided into subtypes according to the underlying anatomy and pathophysiology. Open-angle glaucoma can be classified as primary open-angle glaucoma (POAG), normal-tension glaucoma (NTG), and secondary open-angle glaucoma (SOAG) [1].

The diagnosis of glaucoma is based on Goldmann appplanation tonometry, gonioscopy, combined analysis of structural damage by clinical examination of the optic disc complemented by imaging examinations (optical coherence tomography), and functional damage, by performing visual field tests [2].

Glaucoma is the leading cause of irreversible blindness worldwide [3]. Of the 33.6 million adults aged 50 years and older who were blind in 2020, glaucoma was responsible for 3.6 million cases, equivalent to a prevalence of 11% [4].

Tham et al in 2013 estimated the total number of people aged 40 to 80 years affected by glaucoma worldwide at 64.3 million with a prevalence of 3.54%, and that it would rise to 111.8 million by 2040, disproportionately affecting people residing in Asia and Africa [3].

A survey on the prevalence and types of glaucoma in Nepal in Asia found that the overall prevalence of glaucoma was 1.9%, including 68% POAG, 22.67% PACG, and 9.33% secondary glaucoma [5].

In the United States, Kelly et al. estimated that the Georgia population will have approximately 254,047 cases of glaucoma by 2050 among people aged 40 years and older [6].

In the United Kingdom, the most common type of glaucoma is POAG, which affects 2% of people aged

over 40 years and 10% of people aged over 75 years, particularly Afro-Caribbeans [7].

In Europe in 2015, Kapetanakis VV et al estimated that 7.81 million people were affected by POAG with a prevalence of 2% [8].

Black individuals develop POAG earlier than individuals of other ethnicities [9] and are 2.8 times more likely to develop POAG than those of European ancestry. In 2013 in Africa, the prevalence of glaucoma was 4.79% and should increase to 19.14% by 2040 with a POAG prevalence of 16.26% [3].

Kyari et al. in 2012, in a national survey on the prevalence and types of glaucoma in Nigeria, found that the total prevalence of glaucoma in Nigeria was 5.02% and estimated that 1.2 million adults over 40 years had glaucoma, the vast majority unaware of their disease status, with a proportion of blindness of 20%. They also reported that prevalence increased with age and was higher in men, illiterate individuals, and the Igbo ethnic group [10].

CISSE Fode Oumar in Guinea, in his doctoral thesis on the surgical management of ophthalmological pathologies in children aged 0 to 15 years at the ophthalmology service of the Regional Hospital of Kankan, had reported 20% of congenital glaucoma cases and 1% of infantile glaucoma diagnosed [11].

Methodology

Study setting: Our study was conducted at the Center for Application of the Specialized Studies Diploma in Ophthalmology (CADESO) located within the National Hospital of Donka in the Dixinn commune of Conakry, Republic of Guinea.

Data collection tools : We used our survey forms.

Sources: We conducted individual interviews, used our survey forms, and consulted patient medical records and consultation registers.

Literature data: Our data were discussed in light of recent articles from research sites such as PubMed, Cureus, National Center for Biotechnology Information, ScienceDirect, ResearchGate, World Glaucoma Association, Europe PMC, Journal of

Pharmacy and Bioresources, African Vision and Eye Health.

Data analysis and processing: A database was designed and Epi-info version 7.2.1 and Microsoft Office 2016 (Word, Excel) software were used for data entry, table design, and figure creation.

Study type and period: This is a prospective cross-sectional descriptive study of 3 months duration from October 20, 2021 to January 19, 2022.

Target population: All patients suspected or not of glaucoma who underwent complete ophthalmologic examination including corrected visual acuity, slit-lamp examination, IOP measurement, gonioscopy, and fundus examination at CADES0.

Study population: Our study included all patients diagnosed with glaucoma after performing all required examinations.

Inclusion criteria: We included all patients who came for consultation presenting or not with signs of glaucoma and who, after performing all necessary examinations, were diagnosed with glaucoma and agreed to participate in our study.

Exclusion criteria: Excluded from our study were all patients whose diagnosis of glaucoma was not retained, those who did not consent to our study, those with non-glaucomatous optic neuropathies, and all other pathologies causing elevated IOP or optic nerve head damage.

Sampling: We proceeded with exhaustive recruitment of all glaucomatous patients at CADES0 who agreed to participate in our survey.

Ethical considerations: Data collection was carried out respecting anonymity and informed consent of our patients.

Results

Table I: Distribution of glaucomatous patients at CADES0 by 10-year age groups

Age	Number	Percentages (%)
0 - 9	6	2.2
10 - 19	5	1.9
20 - 29	14	5.2
30 - 39	15	5.6
40 - 49	9	3.3
50 - 59	72	26.8
60 - 69	86	32
70 - 79	53	19.7
80 - 89	9	3.3
TOTAL	269	100

Table II: Distribution of glaucomatous patients at CADES0 by education level

Education level	Number	Percentages (%)
No schooling	40	14.9
Primary	78	29
Secondary	46	17.1
Higher	105	39
Total	269	100

Table III: Distribution of glaucomatous patients at CADESO by occupation

Occupation	Number	Percentages (%)
Student	17	6.3
Civil servant	68	25.3
Self-employed	99	36.8
Housewife	45	16.7
Unemployed	40	14.9
Total	269	100

Table IV: Distribution of glaucomatous patients at CADESO by medical history

History	Number	Percentages (%)
Hypertension	81	30.1
Diabetes	16	6
Myopia	14	5.2
Family glaucoma	8	3
Uveitis	3	1.1
Surgical	24	9

Table V: Distribution of glaucomatous patients at CADESO by risk factors they were exposed to

Main risk factors	Percentages (%)
Advanced age	85.1
Myopia	5.2
Hypertension	30.1
Diabetes	6
Genetic factors	3

Table VI: Distribution of glaucomatous patients at CADESO by slit-lamp examination results

Slit-lamp result	RE Number	RE %	LE Number	LE %
Elevated IOP	176	65.4	173	64.3
Enlarged optic disc excavation	242	90	244	91
NRR thinning	69	25.7	66	24.5
Disc hemorrhage	5	1.9	4	1.5
High C/D ratio	248	93.2	238	89.8

Table VII: Distribution of glaucomatous patients at CADESO by reason for consultation

Reason for consultation	Number	Percentages (%)
Photophobia	45	16.7
Tearing	36	13.4
Decreased visual acuity	212	78.8
Headaches	27	10
Ocular pain	36	13.4
Megalocornea	3	1.1
Ocular trauma	3	1.1
Colored halo	3	1.1

Table VIII: Distribution of glaucomatous patients at CADESO by therapeutic classes of prescribed antiglaucomatous medications

Therapeutic classes	Number	Percentages (%)
Prostaglandin analogs	101	37.6
Beta-blockers	202	75.1
Cholinergics	1	0.4
Carbonic anhydrase inhibitors	69	25.7
Alpha-adrenergic agonists	3	1.1

Table IX: Distribution of glaucomatous patients at CADESO by types of prescribed therapeutic combinations

Therapeutic classes	Number	Percentages (%)
Monotherapy (PA)	33	12.3
Monotherapy (BB)	100	37.2
Monotherapy (CAI)	3	1.1
Monotherapy (AA)	1	0.4
Dual therapy (PA + BB)	37	13.8
Dual therapy (PA + CAI)	2	0.7
Dual therapy (BB + CAI)	35	13
Dual therapy (BB + AA)	1	0.4
Triple therapy (PA + BB + CAI)	27	10
Quadruple therapy (PA + BB + CAI + Cholinergic)	1	0.4
Quadruple therapy (PA + BB + CAI + AA)	1	0.4

Table X: Distribution of glaucomatous patients at CADESO by active ingredients of prescribed antiglaucomatous medications

Active ingredients	Number	Percentages (%)
Timolol	195	72.5
Carteolol hydrochloride	7	2.6
Latanoprost	66	24.5
Bimatoprost	4	1.5
Travoprost	31	11.5
Acetazolamide	34	12.6
Dorzolamide	42	15.6
Brinzolamide	2	0.7
Tetryzoline	1	0.4
Brimonidine	2	0.7
Pilocarpine hydrochloride	1	0.4

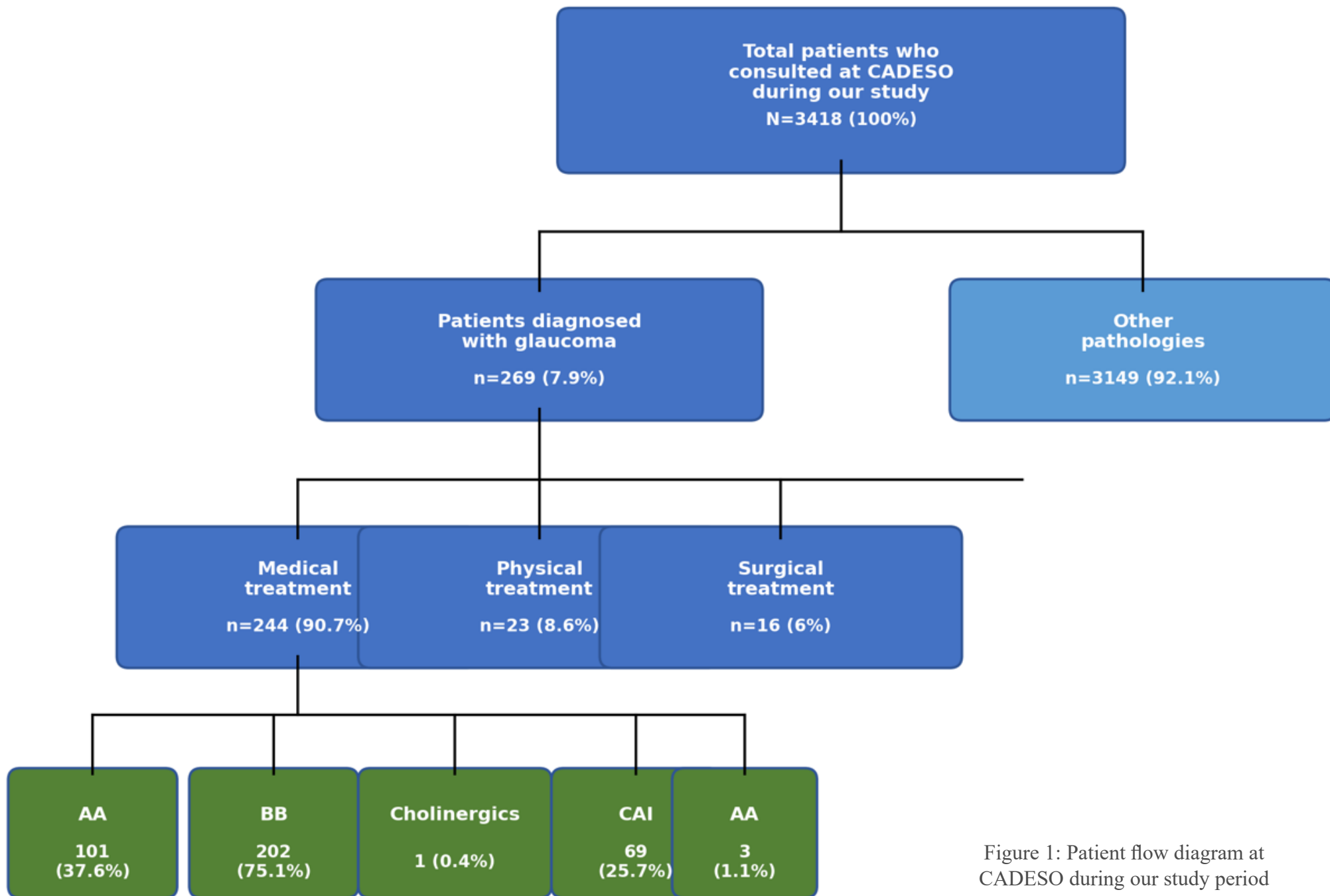


Figure 1: Patient flow diagram at CADESO during our study period

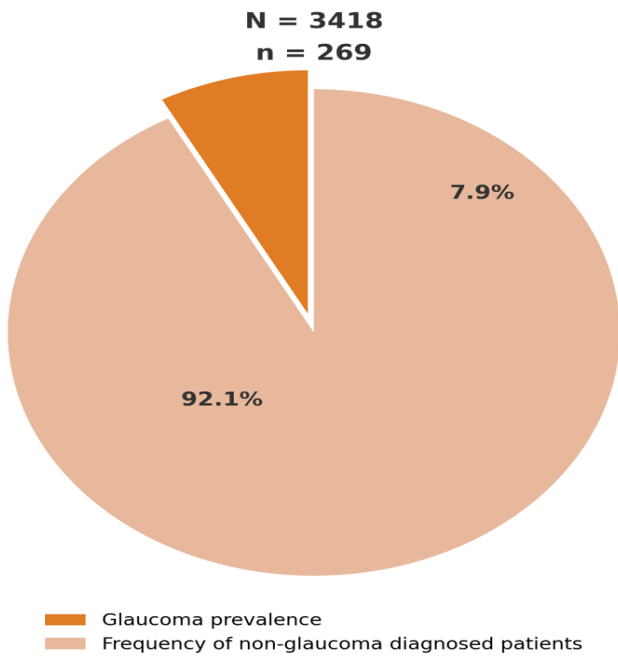


Figure 2: Prevalence of glaucoma at CADES0

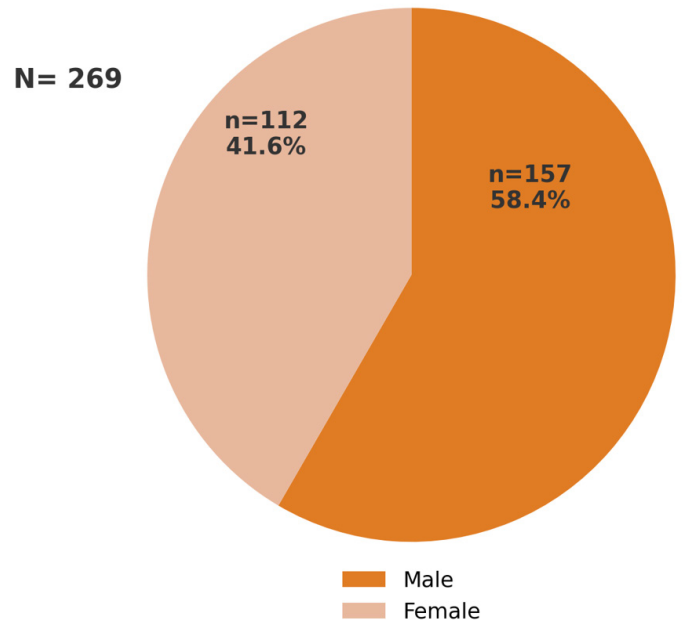


Figure 3: Distribution of glaucomatous patients at CADES0 by sex

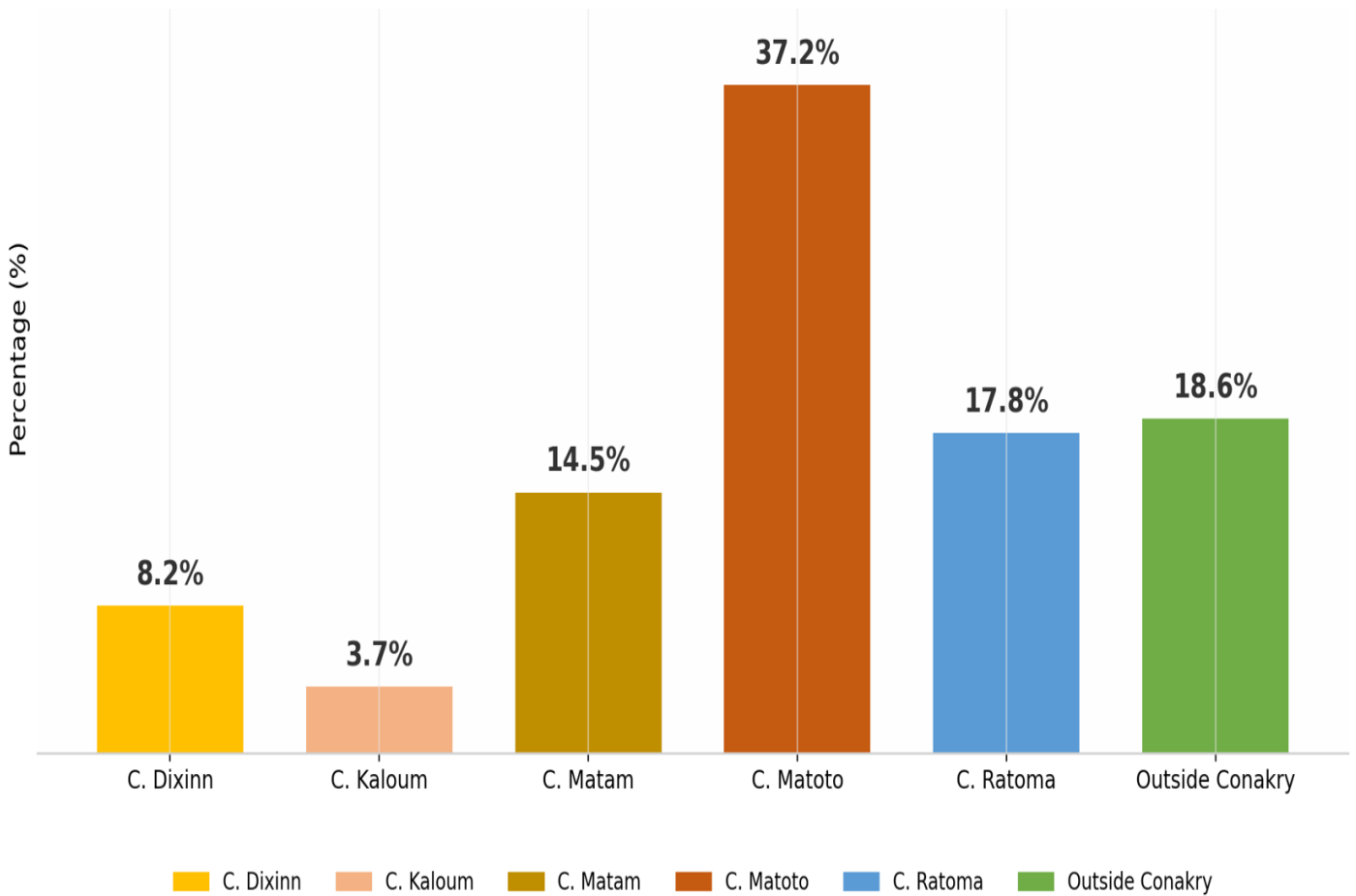


Figure 4: Distribution of glaucomatous patients at CADES0 by place of origin

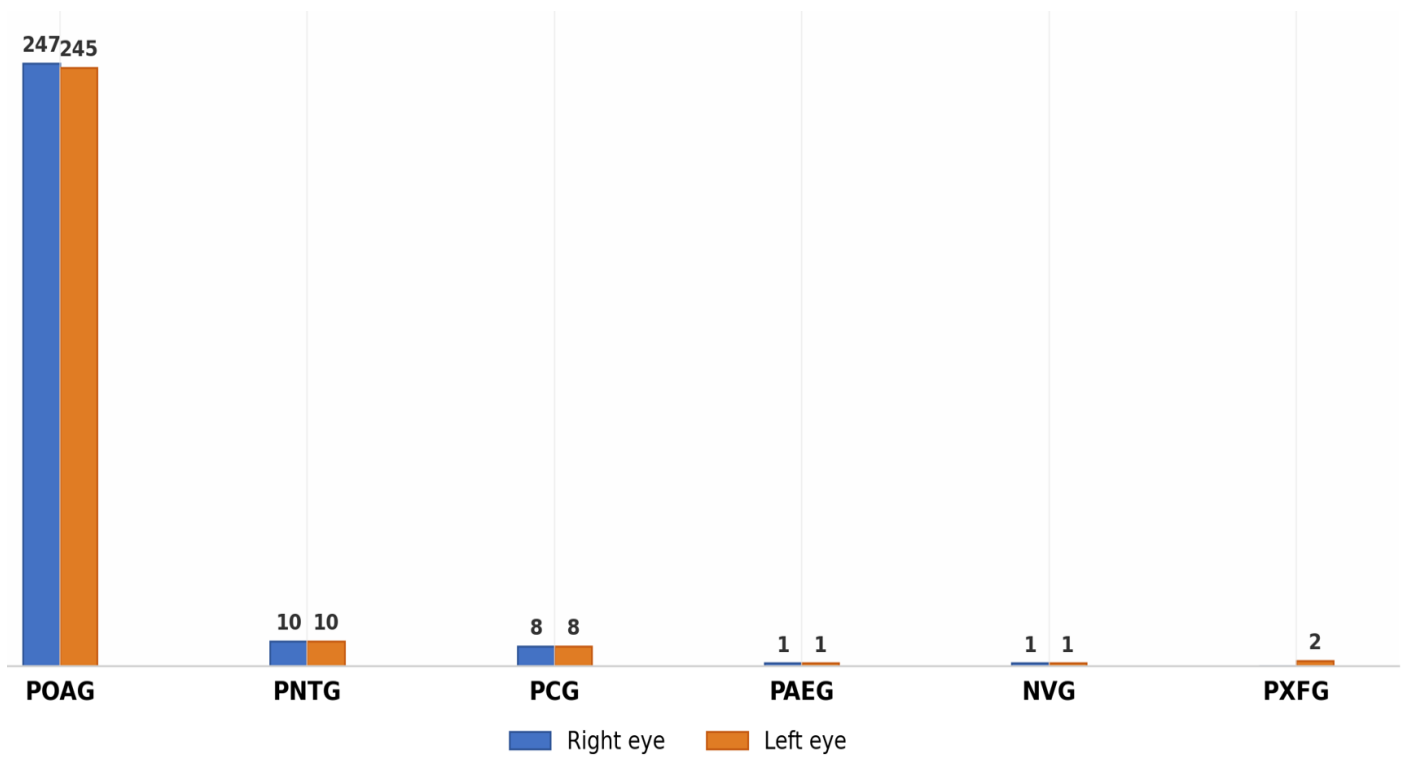


Figure 5: Distribution of glaucomatous patients at CADESO by type of glaucoma

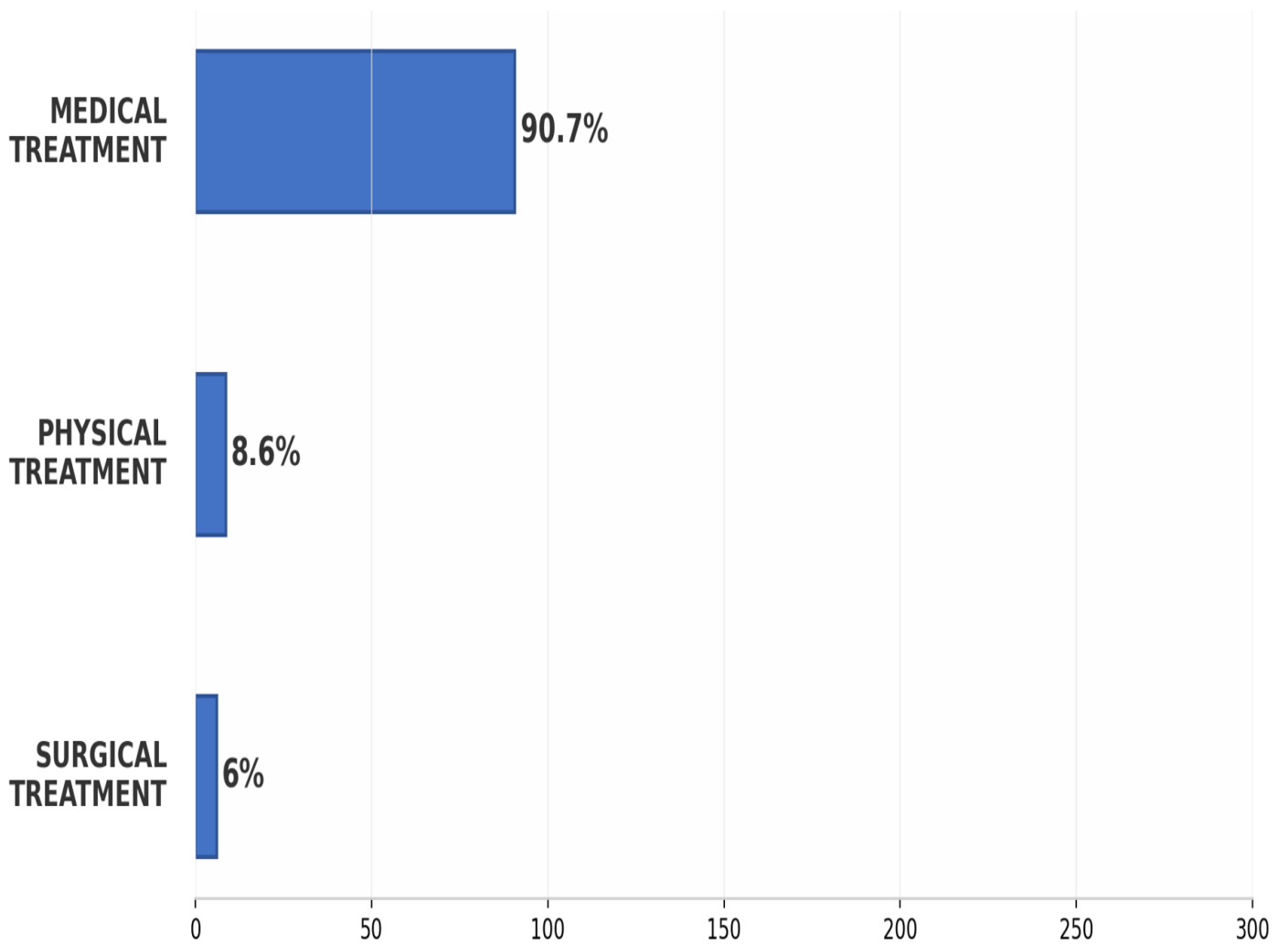


Figure 6: Distribution of glaucomatous patients at CADESO by type of treatment received

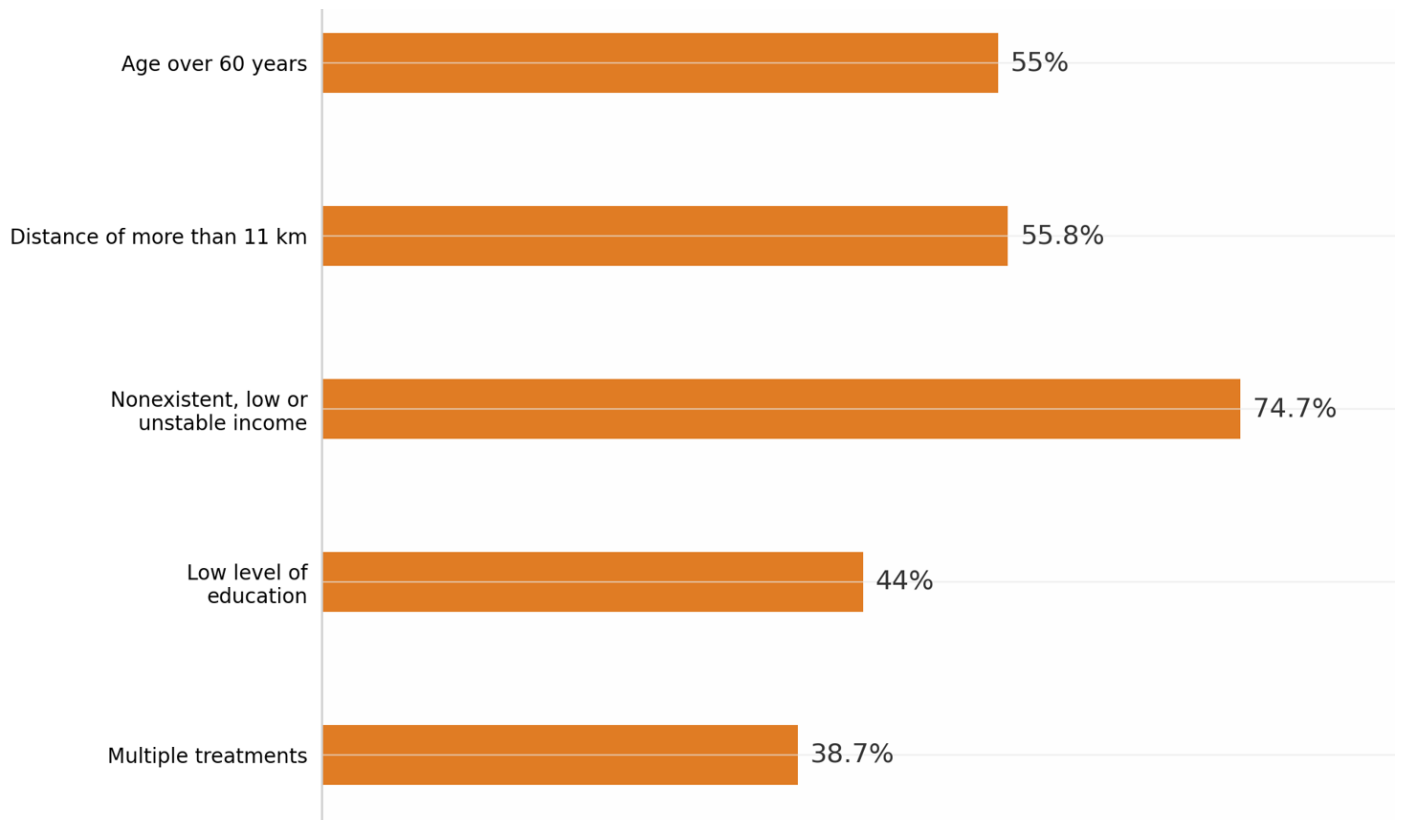


Figure 7: Distribution of glaucomatous patients at CADESO by factors limiting access to treatment

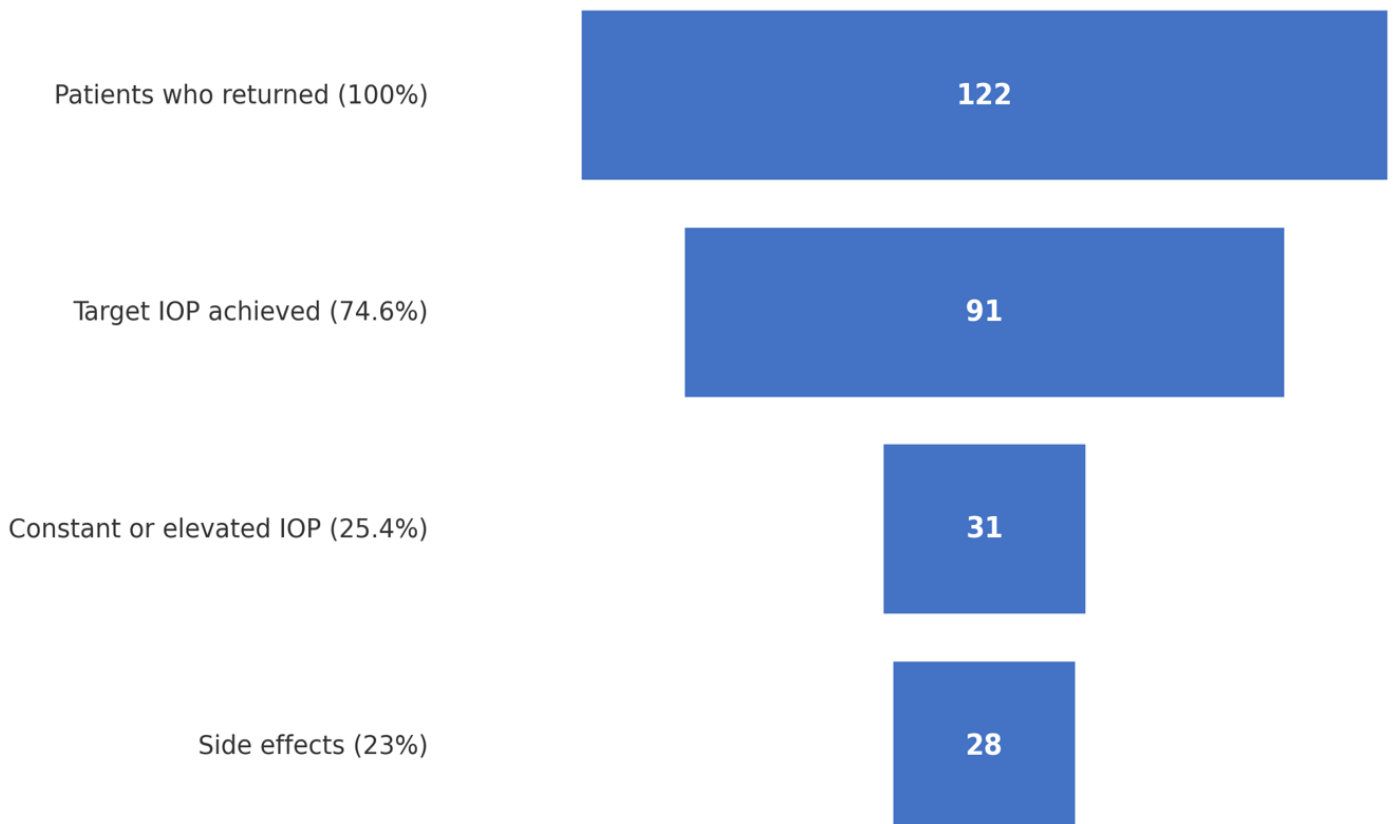


Figure 8: Distribution of glaucomatous patients who returned during our survey according to whether their target IOP was reached or not and side effects

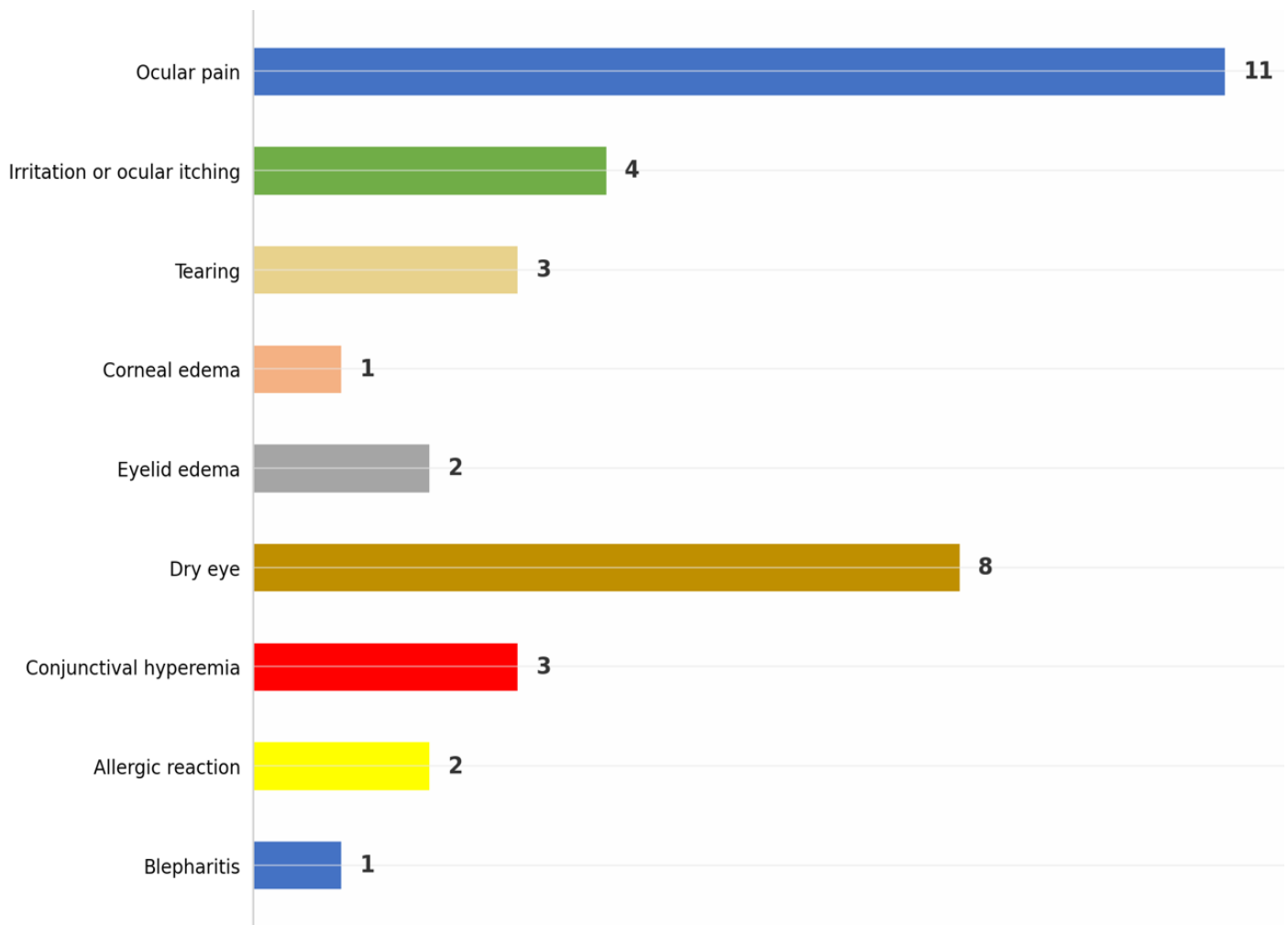


Figure 9: Distribution of glaucomatous patients who returned during our survey according to the side effects presented

Discussion

We conducted a prospective cross-sectional study of 3 months duration from October 20, 2021 to January 19, 2022.

Although several previous studies in Guinea have provided data on glaucoma, this work is the first in Conakry that focuses on the prevalence of glaucomas, its different types, and treatments.

Another strength of our study is that it is prospective with a relatively large number of 269 people who participated. It was both qualitative and quantitative and allowed us to quantify the number of patients with glaucoma who presented and to describe the modalities of management.

The single-center nature of our study induces a selection bias.

Epidemiological variables

In our series, out of a total of 3418 patients who consulted during our study period, we collected 269 glaucomatous patients, representing a prevalence of 7.9%, and 85.1% of them were over 40 years old. These observations are in agreement with the prevalence in Ethiopia where Daba KT et al in 2020 reported a prevalence of 10.2% [12]. In Sub-Saharan Africa, this prevalence was estimated at 4% in people over 40 years old in 2012 [13].

The 60 to 69 years age group predominated at 32% of the total with a mean age of 57.29 +/- 17.06 years. This result is comparable with the majority of previous studies on the subject [5, 14]. Our high prevalence in the elderly could be the consequence of improved life expectancy, allowing this age-related pathology to become established.

The male sex was predominant (58.4%) with a sex ratio of 1.4. As in our series, Atipo-Tsiba et al found

a male predominance but with a sex ratio of 1.8 [15]. On the other hand, in the recent study by Ezinne et al, the authors report a female predominance [16]. This difference could simply be due to a recruitment bias. Moreover, in Africa, all proportions kept, women consult health centers less than men due to illiteracy, low purchasing power of women, and the absence of a real social security system.

Of our patients, 81.4% resided in Conakry while 18.6% came from rural areas. These results contrast with those of Kyari et al in Nigeria in 2016 who recorded 76.6% of patients living in rural areas versus 23.4% urban dwellers [17]. This could be explained by difficulties of access and transport and the dilapidated state of national roads.

Clinical variables

Several risk factors for glaucoma have been reported in the literature [18]. Among them, advanced age, hypertension, and diabetes were the most found in our respondents with respective proportions of 85.1%, 30.1%, and 6%. It is well known that advanced age and cardiovascular diseases are risk factors for glaucoma.

Our study revealed that 78.8% of our patients consulted for decreased visual acuity and 16.7% for photophobia; 65.4% presented with IOP greater than 21 mmHg, 91% with enlarged optic disc excavation, and 93.2% with a C/D ratio greater than 0.4. These high frequencies suggest late diagnosis given that glaucoma has already had time to evolve silently, which is confirmed by the study according to which 50% of patients with glaucoma in Africa are already blind in one eye at presentation [19].

According to recent estimates, the overall prevalence of POAG was estimated at 3.05% and that of PACG was 0.50% [3]. In our series, POAG was the most diagnosed type of glaucoma, i.e., 91.8% of cases versus 0.7% of PACG. Our observations are comparable to those of Atipo-Tsiba et al in Congo and Usifoh et al in Nigeria who highlighted POAG in respectively 91% and 91.2% of their surveyed glaucomatous patients [20, 21]. Our proportions are also consistent with other African data [5, 22]. In the

United Kingdom in 2016, the most common type of glaucoma was POAG, which affected 2% of people aged over 40 years and 10% of people aged over 75 years, particularly Afro-Caribbeans [7]. In Europe in 2015, Kapetanakis et al had recorded 7.81 million people affected by POAG with a prevalence of 2% [8]. These prevalence variations can be explained by genetic factors.

Therapeutic variables

Therapeutically, the objective is to reduce IOP by medicinal, physical, and/or surgical means. Medicinal means are used more often but failure, insufficiency, intolerance, or non-compliance push the practitioner to perform trabeculoplasty, or even trabeculectomy [23]. In our series, medications were more prescribed, i.e., in 90.7% of our patients, followed by selective laser trabeculoplasty in 8.6%, and then trabeculectomy in 6%. Our low rate of surgical recourse could be attributed to the high cost of surgery, superstitions, and sociocultural beliefs [24]. In Ethiopia, authors reported a high rate of surgical recourse for glaucoma as ophthalmologists in the country prefer surgery to medications due to patient non-compliance with treatment [25].

In our series, beta-blockers were the most used, i.e., in 75.1% of cases, followed by prostaglandin analogs in 37.6% of cases, and carbonic anhydrase inhibitors in 25.7% of cases. Another study conducted in Ghana also concluded that beta-blockers constituted the mainstay of treatment [26]. This could be explained by the fact that they are more affordable and more easily available than other classes of medications, particularly prostaglandin analogs, whose local side effects such as conjunctival hyperemia, ocular irritation, ocular pain, and burning sensation can be unpleasant for elderly people.

Regarding therapeutic combinations, monotherapy largely dominated (137 patients), followed by dual therapy (75 patients), triple therapy (27 patients), and quadruple therapy (2 patients). The predominance of monotherapy could be the result of it being an initial treatment, as it is recommended to start with one molecule and change therapeutic class if the latter is

effective but does not allow reaching the target IOP; a molecule from another family is then associated. The supremacy of BB monotherapy could be linked to the fact that patients do not respond sufficiently to PAs or have a contraindication to PAs. As for the large number of patients treated with multiple therapy (104 patients), this would be justified by the need for increased IOP reduction. According to Dufrane et al, 40% of patients in their study were treated with two or more medications after 5 years [23]. According to other studies focused on the subject, IOP reduction would be more marked in triple therapy than in dual therapy, and more in dual therapy than in monotherapy [27, 28].

Among the active ingredients prescribed, timolol (72.5%) was at the top of the list, followed by latanoprost (24.5%). This would be justified by an efficacy concern as timolol is indicated for patients who do not respond sufficiently or who have a contraindication to topical prostaglandins. The choice of latanoprost would be due to the fact that it is the prostaglandin analog most indicated in terms of efficacy-safety and allows for long-term use (more than 5 years), not to mention that it has direct neuroprotective properties on the optic nerve by ensuring the survival of retinal ganglion cells [29].

Surveillance

Among the 122 patients who returned for follow-up, 91 reached the target IOP with a frequency of 74.6%. Sounouvou et al in Benin in 2011 had recorded 100% of IOP decrease cases. This shows the efficacy of the various treatments administered but also the lack of treatment compliance by some patients.

As with any treatment, side effects may be observed. Patients mainly reported ocular pain, ocular dryness, itching or ocular irritation, conjunctival hyperemia, and tearing. Indeed, the recorded side effects are known and predictable as reported in the literature [30].

Many of our patients had reasons preventing them from following the prescribed treatments. Thus, the majority (74.7%) of our patients had nonexistent, low, or unstable incomes; 38.7% were subject to combined

treatments and therefore to daily self-administration of several eye drops, and to the side effects caused by them. In this regard, Wolfram et al in 2019 recorded in their study that people who experienced side effects reported levels of non-compliance 2 times higher than those who did not experience them [31]. Distance also played a major role: indeed, 55.8% of our patients had to travel distances of more than 80 km to come to CADESO and return. Advanced age was also a factor as more than half of our patients were over 60 years old. On the other hand, only 39% had a university education level; the majority was therefore limited in its ability to learn about the disease and express the full extent of the side effects experienced. All this is in line with the reasons most reported by O. J. KILLEEN et al in South India who in 2020 also mentioned distance, cost, lack of an accompanying person, insufficient information about the disease, with a mean patient age of 62 +/- 12 years [32].

The main limitations of our study were:

- The non-performance of automated visual field examinations and optical coherence tomography, which did not allow us to detect subclinical glaucoma cases,
- Non-compliance with treatment by some patients,
- The large number of lost to follow-up patients.

Conclusion

At the end of this study, glaucoma appears as a potentially blinding pathology that evolves silently in our societies. The prevalence of glaucoma was 7.9% with a high percentage of POAG (91.8%). The most affected age group was 60 to 69 years with a mean of 57.29 +/- 17.06 years and male predominance. The main treatments prescribed were medicinal, SLT laser, and trabeculectomy. Among the administered medications, beta-blockers, namely timolol, were the most represented in mono and dual therapy.

Further research on optic nerve protection would be useful for maintaining a good quality of life for patients, and the popularization of diagnostic and therapeutic means through information, awareness, and subsidies

would allow early prevention and/or treatment and also prevention of glaucoma complications.

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Conflict of interest : None

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