BMC Geriatrics

RESEARCH

Open Access

Glaucoma prevalence and treatment in sub-Saharan Africa's elderly population: a scoping review

Jacob Owusu Sarfo[1,2], Prince Mordi[2,3], Esi Kyirba Aggrey[2,3], Adjoa Safoa Panyin Quaicoe[4] and Priscilla Yeye Adumoah Attafuah[5*]

Abstract

Background Glaucoma is one of the leading causes of visual impairment and blindness globally, mainly affecting older adults. Disproportionately affecting people of African descent, its high prevalence, combined with the region's limited healthcare infrastructure and access to eye care services, make it a major public health challenge deserving attention in sub-Saharan Africa.

Objective This paper aims to synthesise current literature on glaucoma prevalence and management options among older adults in sub-Saharan Africa.

Materials and methods A systematic search was conducted using databases including PubMed, Scopus, Medline, and Google Scholar. Following inclusion criteria and study objectives, five published articles from 2013 to 2022 were included in this scoping review.

Results We found that, generally, across various studies reviewed, the prevalence of glaucoma among adults aged 60 and above was high. Glaucoma prevalence increases with age. Current management options were pharmacotherapy, surgery and laser, with pharmacotherapy most often the first line. Although initially cheaper, the other options are practical and cost-effective over time.

Conclusion This scoping review adds to evidence that with the growing population, glaucoma continues to be a public health issue since glaucoma has a high prevalence among older adults, particularly in SSA. With most of the sub-Saharan population's high prevalence and low-income levels, ideal management must include early screening and detection and reliable and long-term treatment options that are not particularly dependent on patient compliance and adherence. Evidence-based policies are needed to reduce the prevalence of glaucoma-related visual impairment for older adults across sub-Saharan Africa.

Keywords Glaucoma, Prevalence, Management, Sub-Saharan Africa, Scoping review

*Correspondence:
Priscilla Yeye Adumoah Attafuah
pyaattafuah@ug.edu.gh
[1]Department of Health, Physical Education and Recreation, University of Cape Coast, Cape Coast, Ghana
[2]Centre for Behaviour and Wellness Advocacy, Koforidua, Ghana
[3]Department of Optometry & Vision Science, University of Cape Coast, Cape Coast, Ghana
[4]Emmanuel Eye Medical Centre, Accra, Ghana
[5]Public Health Nursing Department, School of Nursing and Midwifery, University of Ghana, Legon, Accra, Ghana

Introduction

Glaucoma is one of the leading causes of visual impairment and blindness globally, mainly affecting older adults [1]. Globally, it is estimated that approximately 7.7 million people are affected by glaucoma [1–3]. Glaucoma results in optic nerve damage and is usually associated with increased intraocular pressure [4]. When left untreated, it can lead to irreversible blindness.

Sub-Saharan Africa (SSA) makes up 11% of the global population and has a global disease burden of 24% [5]. The prevalence rate of glaucoma is high in sub-Saharan Africa (SSA), and it poses significant public health challenges due to the region's limited healthcare infrastructure and access to eye care services [6]. Ocansey et al. [7] reported a 4.4% prevalence of glaucoma in the African region. With people of African descent being disproportionately affected by glaucoma, particularly primary open glaucoma [8] and the high prevalence of the disease, glaucoma is a significant public health concern in SSA.

The SSA region faces unique barriers in managing glaucoma, including a severe shortage of ophthalmologists, inadequate healthcare facilities, and limited access to diagnostic and therapeutic technologies [9]. Additionally, accessibility to healthcare facilities is still a challenge [10]. SSA has approximately 2.5 ophthalmologists per million people, which is far below the recommended standard and significantly impedes effective glaucoma management [9]. Socioeconomic factors further increase the burden of glaucoma in SSA. Rural areas are disproportionately affected due to logistical barriers and insufficient health education, leading to delayed diagnosis and treatment [11].

Poverty significantly limits access to essential eye care services, and educational disparities also contribute to a lack of awareness about the disease and its potential consequences [12]. These socioeconomic and environmental factors collectively hinder effective management and increase the prevalence of glaucoma among older adults in SSA. Therefore, targeted interventions are needed to address these disparities and improve eye health outcomes.

According to Olawoye et al. [13], SSA has many management strategies. However, these strategies face significant barriers, some of which are cost, accessibility, and adherence challenges. Medications for glaucoma management, though cheaper than surgical interventions among the population, are often inaccessible due to high costs and limited availability [14]. Surgical options, although practical, are underutilised due to the scarcity of surgical facilities and trained personnel [15] and some level of fear associated with surgery [16]. Health education initiatives aimed at raising awareness and promoting early detection are often hampered by educational disparities and logistical constraints [17].

Studies have postulated that age is a known risk factor for glaucoma [18, 19]. With the increase in life expectancy across countries in SSA, there is expected to be an increase in the ageing population in the region. Also, people of African descent are highly susceptible to glaucoma; this only shows that in the ageing population in SSA [20], these challenges facing eye care services and the existing socioeconomic issues affecting the management of the condition can be very detrimental to the population.

Glaucoma is a leading public health concern, and more studies are needed on its prevalence and management among older adults in SSA. This review aims to comprehensively assess the prevalence and management of glaucoma among older adults in SSA.

Method

This scoping review was conducted following the six-stage framework by Arksey and O'Malley [21]. The framework was adopted because it helps assess the literature, examine what has been done and identify gaps in knowledge that need attention. Arksey and O'Malley suggest that the following stages should be followed in conducting a scoping review: (1) identifying and stating the research questions; (2) identifying relevant studies; (3) study selection; (4) data collection; (5) data summary and synthesis of results; and (6) consultation (See Table 1).

In the first stage, we identified and formulated the research questions to guide this scoping review: (1) what is the prevalence of glaucoma among older adults in SSA? (2) What are the current management strategies for glaucoma in SSA? (3) What are the barriers to effective management and treatment of glaucoma among older adults in SSA?

Results

The search was conducted in four main databases, and 302 records were produced. An additional 28 records were identified through a Google and citation search. After removing duplicates (235) using Rayyan software,85 articles were eligible for screening. Fifty of this number were excluded because they did not meet the inclusion criteria. Finally, twenty-one (21) full-text records were included in the thematic analysis and synthesis (see Fig. 1 for details on the screening process in the PRISMA flow diagram).

Characteristics of included studies

The literature review included studies conducted in SSA on the prevalence and management of glaucoma among older adults. Of the 21 studies reviewed, nine were cross-sectional, six were retrospective, two were prospective, three were multicentre, and one was a randomised control trial.

Table 1 Search strategy for articles on the prevalence and management of Glaucoma among older adults in SSA

Search Strategy Item	Search Strategy
Databases	PubMed, Scopus, Web of Science, Cochrane Library Language
Time Filter	(2000–2024)
Spatial Filter	"sub-Saharan Africa", OR "Angola" "Benin", OR "Botswana" OR "Burkina Faso" OR "Burundi" OR "Cape Verde" OR "Cameroon" OR "Central African Republic" OR "Chad" OR "Comoros" OR "Congo" OR "DR Congo" OR "Cote d'Ivoire" OR "Equatorial Guinea" OR "Eritrea" OR "Eswatini" OR "Ethiopia" OR "Gabon" OR "Gambia" OR "Ghana" OR "Guinea" OR "Guinea Bissau" OR "Kenya" OR "Lesotho" OR "Liberia" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "Rwanda" OR "Sao Tome & Principe" OR "Senegal" OR "Seychelles" OR "Sierra Leone" OR "Somalia" OR "South Africa" OR "South Sudan" OR "Sudan" OR "Tanzania" OR "Togo" OR "Uganda" OR "Zambia" OR "Zimbabwe."
Keywords	1. "Glaucoma" OR "Ocular Hypertension" 2. "Prevalence" OR "Incidence" OR "Epidemiology" 3. "Management" OR "Treatment" OR "Intervention" OR "Surgery" OR "Medication" 4. "Older adults" OR "Elderly" OR "Aged" OR "Senior"
Inclusion Criteria	The paper should be: 1. peerreviewed or grey literature 2. published in 2000 and later 3. conducted in subSaharan African countries 4. published in the English language. 5. conducted on adults aged 60 years and above. 6. on the prevalence, risk factors, and management strategies for glaucoma.
Exclusion Criteria	If the paper is: 1. Conducted on people under 60 years. 2. Conducted in countries outside sub-Saharan Africa. 3. Published online before the year 2000. 4. A report, review, abstract, minutes, commentary, letter to editors, preprint, literature reviews. 5. Outside the variables of interest.

All studies were conducted in SSA countries, and all papers were published from 2000 to 2024. Ten studies addressed the prevalence among the targeted population, and eleven addressed management options in treating glaucoma. Based on the research questions, two main themes were derived from the reviewed studies: (1) Prevalence of glaucoma among older adults in SSA; (2) Current management strategies for glaucoma in SSA.

Prevalence of glaucoma among older adults in SSA

In identifying various causes of visual disability and impairment in SSA, particularly older adults, glaucoma was reported as one of the leading causes of blindness or visual disability [22, 23]. A study revealed that one in every 5 persons with glaucoma in the region was blind [6]. With the high prevalence of glaucoma, particularly among older people, the condition is said to be a public health issue [24].

Various studies reported that primary-open angle glaucoma (POAG) was the most common subtype [25, 26]. These studies recorded prevalence rates comparable to those in other black populations. Although POAG is the most prevalent glaucoma subtype, Primary Angle Closure Glaucoma (PACG) was also found to have a significant prevalence [27, 28].

Management of glaucoma

Available therapy for glaucoma in SSA includes medical therapy, surgical treatment, and laser procedures. A multicentre cross-sectional study revealed that medical therapy was the first-line option for managing glaucoma in the region, whilst laser was underutilised even in centres where it was available [29]. A randomised control trial which compared timolol- one of the most affordable and commonly used glaucoma medications, with selective laser trabeculoplasty (SLT) in patients with glaucoma showed that although timolol was more common, SLT was superior to managing IOP [30].

It was also established that treatment of glaucoma in this region is difficult due to the cost and unavailability of most treatment options. Even with the higher cost of surgical interventions, low levels of complaints for medication give surgical interventions an upper hand [31, 32]. However, a study conducted among ophthalmologists showed that one main limitation of trabeculectomies in Nigeria was the unwillingness of patients to agree to the surgical intervention [30]. The study found a low trabeculectomy rate of 0.9/ophthalmologists/month [30]. Papers which focused on glaucoma surgery and its output revealed that there was a low rate of glaucoma surgery, and some factors causing this were fear of surgery and fear of going blind [33–35].

For glaucoma surgeries in Nigeria, trabeculectomy with intraoperative 5-fluorouracil was the most common surgical intervention [35]. Another study on glaucoma surgeries in Nigeria ranked trabeculectomy as the most performed procedure, followed by g-probe and laser trabeculoplasty [36].

One paper on trabeculectomy outcomes in a Nigerian population in 2000 revealed that trabeculectomy without antimetabolite was more effective in reducing IOP in advanced glaucoma [37]. However, another paper in 2006 in Rwanda revealed that trabeculectomy with antimetabolites is one of the best available options for glaucoma management in SSA [38]. In addition, another study showed that Mitomycin-C as a supportive treatment during trabeculectomy in black Africans had a great effect on lowering IOP amidst complications [39].

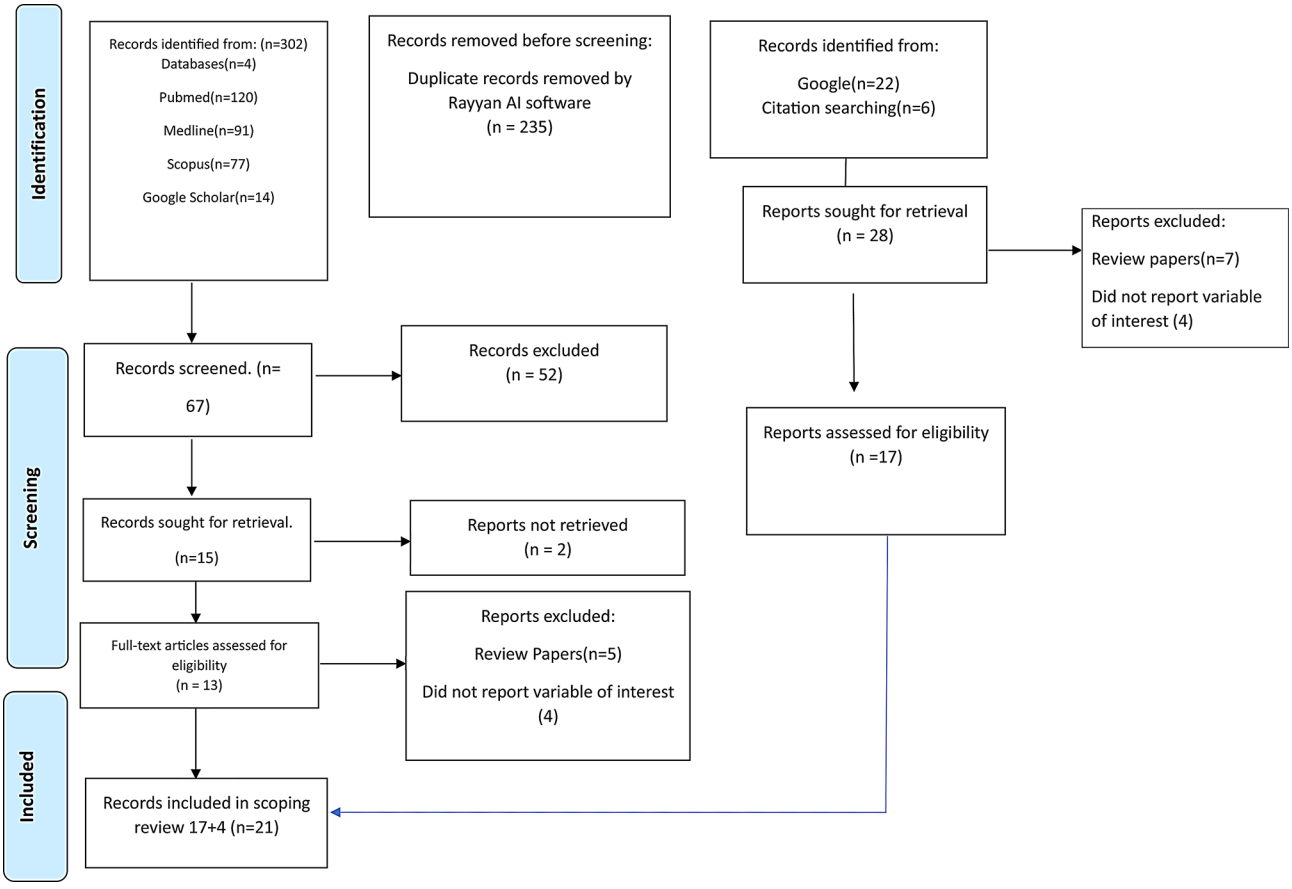

Fig. 1 PRISMA flow diagram

Furthermore, in Southwest Ethiopia, the Ahmed glaucoma valve was said to be an effective and safe procedure [40].

Few reports on the outcomes of laser procedures exist due to their low acceptance. A study on the effectiveness of primary transscleral diode laser cyclo photoablation for glaucoma in Nigeria concluded that the procedure controlled IOP in almost three-quarters of eyes at 12 months with short-term preservation of vision and very low complications [41] (See Table 2 and Fig. 2).

Discussion

Glaucoma is one of the most common causes of vision impairment globally. With people of black descent being susceptible to glaucoma and the limited accessibility to health services, glaucoma continues to be a significant public health concern. This review focused on presenting available data on the prevalence and management options for glaucoma among older adults in SSA [42].

Prevalence of glaucoma among older adults in SSA

Glaucoma was identified as one of the major causes of visual impairment in SSA. In Uganda, a study revealed that glaucoma had a prevalence of 11.7% and was the third cause of visual impairment [22]. In Osun state, Nigeria, glaucoma was noted to be the second cause of blindness in the region (32.4%) [23].

Various studies have been conducted in various regions in SSA to determine the prevalence of glaucoma. All studies which focused on glaucoma prevalence established there is a high prevalence of glaucoma in this region. In an East African population, glaucoma was prevalent in 4.16% of the study population (a total of 3268 people) [26]. In Akinyele district, Southwestern Nigeria, the prevalence of glaucoma was 7.3%, and in Tema, Ghana, the prevalence of POAG was 6.8% [43]. These prevalence rates are similar and comparable to prevalence rates from the Barbados Eye Study [44].

It is also worth noting that the prevalence of glaucoma was also seen to increase with increasing age. The results of Kyari et al.'s study showed that the prevalence of glaucoma among those aged 60–69 was 6.42%, aged 70–79 10.77%, and age 80 + 14.74% [6]. This was like another paper, with a glaucoma prevalence of 12.2% amongst the 60–79 age group and 14.6 for both the 70–79 and 80 and above age groups [26].

For the prevalence of glaucoma subtypes, POAG was the most common subtype in the region. In the East

Table 2 Data extraction sheet

Author	Year	Study Title	Country	Population	Study Design	Sample size	Summary findings
1. Buhrmann et al.	2000	Prevalence of Glaucoma in a rural East African Population	Tanzania	33 villages in the district within 1 h of Kongwa town. Persons aged 40 years and above, mean age: 53 ± 10.9	Cross-sectional study	3247 subjects completed the study	The prevalence of glaucoma of all types was 4.16% (95% confidence interval [CI] 5 3.5, 4.9%). Primary open-angle glaucoma (OAG) was diagnosed in 3.1% (95% CI 5 2.5, 3.8%), primary angle-closure glaucoma (ACG) in 0.59% (95% CI 5 0.35, 0.91%), and other forms of glaucoma in 0.49%. The high prevalence of OAG in this group was like that of African-derived persons in the United States, but less so in African-Caribbean populations.
2. Anand et al.	2000	Trabeculectomy outcomes in advanced glaucoma in Nigeria	Nigeria	A retrospective case-note search was done from operating theatre records in a private hospital in Lagos, Nigeria from 1989 to 1999	Retrospective study	134 patients,189 eyes were identified from the operating theatre records, with a mean age of 65 years	When the criteria for success were an intraocular pressure (IOP) of less than 22 mmHg, 30% reduction from pre-operative levels and a decrease in visual acuity of less than 3 Snellen chart lines, then by life-table analysis success rates were 85%, 82% and 71% at the 1, 2 and 5-year post-operative intervals respectively. Success rates were lower if an IOP of less than 16 mmHg was taken as one of the criteria (65%, 61% and 46% at the 1-, 2- and 5-year intervals, respectively).
3. Mwanza &Kabasele et al.	2001	Trabeculectomy with and without mitomycin-C in a black African population	Congo-Kinshasa		A prospective randomised study	22 eyes of 11 black African patients in Congo-Kinshasa. The average age is 46.8 years, range 29 to 59 years.	The success rate of trabeculectomy was 81.8% in eyes treated with mitomycin-C compared with 63.6% in eyes not receiving this drug. Rates of intraocular pressure reduction were 57.9% and 42.9% respectively. Complications occurred in 36.3% of the eyes managed with mitomycin-C again
4. Adegbehinbe et al.	2006	Blindness and visual impairment among the elderly in Ife-Ijesha zone of Osun State, Nigeria	Nigeria	All people aged 60years or older were gathered at various centres in Ife-Ijesha zone of Osun State, Nigeria	A cross-sectional descriptive community-based study	681 elderly	Cataract (42.3%), glaucoma (32.4%) and uncorrected aphakia (9.9%) were the leading causes of blindness in 69 eyes
5. Budenz et al.	2013	Prevalence of glaucoma in an urban West African Population, The Tema Survey	Ghana	Adults 40 + living in Tema, Ghana study 5603	A population-based, cross-sectional	5603	Primary open-angle glaucoma was the underlying diagnosis in 342 participants (94.5%). The prevalence of primary open-angle glaucoma was 6.8% overall, increasing from 3.7% among those 40 to 49 years old to 14.6% among those 80 years and older

Table 2 (continued)

Author	Year	Study Title	Country	Population	Study Design	Sample size	Summary findings
6. Ashaye et al.	2013	Prevalence and types of glaucoma among an Indigenous African Population in Southwest Nigeria	Nigeria	Residents of Akinyele district of Oyo State in southwestern Nigeria aged 40 years and older were randomly selected in a stratified manner with a mean age of 58 ± 12.8 years	Cross-sectional population-based survey	811 subjects	Primary open-angle glaucoma was found in 6.2% (95% CI 4.5–7.8%) and primary angle closure glaucoma in 0.2% (95% CI 0.0–0.6%). Secondary glaucoma accounted for 0.9% of the cases, with couching and neovascular processes being the main causes (0.2% each). Prevalence of glaucoma increased significantly with increasing age (P for trend < 0.05). The high prevalence of glaucoma (7.3%) in the Akinyele district in southwestern Nigeria is comparable with those in predominantly black populations in the Akwapim-South district of Ghana and Barbados. Primary open-angle glaucoma remains the most prevalent form of glaucoma.
7. Olawoye &Sarimiye	2013	Is angle closure glaucoma a problem in Nigeria?	Nigeria	New glaucoma patients of all age groups	Cross-sectional study	336 consecutive new glaucoma patients of all age groups who presented to the glaucoma clinic of UCH over 1 year.	Of the 336 patients, 60 eyes of 31 patients (9.2%) had angle closure with or without glaucoma
8. Adekoya et al.	2014	Surgical Output and Clinic Burden of Glaucoma in Lagos, Nigeria	Nigeria	OPD patients in selected centres.	A multicentre study involving 2 tertiary eye institutions, 7 secondary eye centres with eye care facilities, and the largest private eye hospital in Lagos state, Nigeria.	6240 patients	A total of 6240 patients visited the OPD over the 4 weeks, out of which 1577 (25.3%) were glaucoma patients. OPD visits per ophthalmologist were 274, 323, and 61, whereas glaucoma visits per ophthalmologist were 75, 70, and 23 in the tertiary, secondary, and private centres, respectively. Glaucoma surgeries constituted 8.6% of total surgeries ($n = 4050$). Trabeculectomy with intraoperative 5-fluorouracil was the most common procedure (81.0%). Number of glaucoma surgeries per ophthalmologist per month in the tertiary, secondary, and private centres were 0.5, 0.9, and 1.4, respectively. The overall number of glaucoma surgery per ophthalmologist per month was 1

Table 2 (continued)

Author	Year	Study Title	Country	Population	Study Design	Sample size	Summary findings
9. Kyari et al.	2015	A Population-based survey of the prevalence and types of glaucoma in Nigeria: Results from the Nigeria National Blindness and Visual Impairment Survey	Nigeria	Adults aged ≥ 40 years	Cross-sectional survey	13,591	Nigeria has a high prevalence of glaucoma, which is mainly open-angle glaucoma. A high proportion of those affected are blind. Secondary glaucoma was primarily a consequence of procedures for cataracts.
10. Gessesse	2015	The Ahmed Glaucoma Valve in Refractory Glaucoma: Experiences in Southwest Ethiopia	Ethiopia	charts of consecutive patients treated with Ahmed glaucoma valve implantation at Jimma University Specialized Hospital between August 2012 and August 2014. S	A retrospective review was conducted	Out of 12 eyes 11 patients were included with a mean age of 40.7 years (SD = 19.0)	The Ahmed glaucoma valve implant appears to be effective and relatively safe for treating complicated glaucoma with a success rate comparable with those reported from other studies
11. Kizor-Akaraiwe & Ogbonnaya	2016	Practice of trabeculectomy by ophthalmologists in Nigeria	Nigeria	All consultant ophthalmologists present at the 2010 Congress of the Ophthalmological Society of Nigeria	Cross-sectional and analytical study	65 out of 80 consenting ophthalmologists responded to the questionnaires	A trabeculectomy rate of 0.9 trabeculectomy/ ophthalmologist/ month was found in this study. It was significantly associated with insufficient exposure to trabeculectomy during residency training and unwillingness on the part of patients to accept glaucoma surgery. There was no significant relationship between higher glaucoma outpatient burden and the number of trabeculectomies carried out by respondents. Ophthalmologists were willing to offer more trabeculectomies to patients if they were certain of improved outcomes and to improve their trabeculectomy skills through short-term skill-enhancement courses.
12. Stefan et al.	2016	Glaucoma surgery outcome in Rwanda	Rwanda	All adult glaucoma patients who underwent trabeculectomy surgery in the Kabgayi Eye Unit	Cross-sectional study	163 eligible patients	Trabeculectomy with anti-metabolites is one of the best available options for glaucoma management in Africa. However, the IOP control reduced at a follow-up duration beyond 2 years, highlighting the importance of regular long-term follow-up
13. Goosen et al.	2017	Racial Differences in Selective Laser Trabeculoplasty Efficacy	South Africa	Glaucoma patients	5-year retrospective chart review	84	Selective laser trabeculoplasty was effective in producing clinically significant IOP reduction in South African adults with or without prior medical or surgical anti-glaucoma therapy

Table 2 (continued)

Author	Year	Study Title	Country	Population	Study Design	Sample size	Summary findings
14. Abdul et al.	2018	Safety and effectiveness of primary transscleral diode laser cyclo photoablation for glaucoma in Nigeria	Nigeria	New glaucoma patients where surgical intervention was recommended.	Prospective case series	201 out of 204 eyes with complete data analysed	: Transscleral diode laser cyclophotocoagulation controlled IOP in almost three-quarters of eyes at 12 months with short-term preservation of vision and minimal complications. Poor follow-up in this setting highlights the need for an effective, safe, and acceptable treatment where regular follow-up is less critical
15. Bogunjoko et al.,	2019	Trends in Glaucoma Procedures and Surgeries at the Eye Foundation Hospital Group, Nigeria	Nigeria	Consecutive glaucoma patients 18 years and older seen at the EFHG, Nigeria	Descriptive retrospective study	The total number of glaucoma surgeries and laser procedures done in the EFHG from 2009 to 2017 was 2186.	Trabeculectomy was the most performed procedure. From 2009 to 2017, trabeculectomy had been decreasing in frequency from 117 to 65 (44%), except for 2015. The frequency of use of glaucoma drainage device (GDD) has been steadily increasing from 1 in 2013 to 26 in 2017, but this is not statistically significant
16. Kyei et al.	2020	Clinical and sociodemographic characteristics of glaucoma patients at a tertiary referral facility in Zimbabwe	Zimbabwe	Zimbabwean patients who had been diagnosed with glaucoma and receiving care at Greenwood Park Eye Center from 2014–2018	Hospital-based retrospective study of patients' records in the archives of Greenwood Park Eye Centre	Out of 9185 folders, 432 participants met the inclusion criteria age range 10–110 with mean age 62.66 and SD ± 15.94 years	The 432 cases were POAG, with 8.1% unilateral glaucoma and 91.9% bilateral. Mainstay treatment was the use of medication only (41.4%) prostaglandin analogues accounted for 151 (47.9%) followed by beta-blockers 66 (21.0%) and alpha-2 adrenergic agonists 9 (2.9%). For combination therapy, prostaglandin analogues and beta-blockers constituted 57 (18.1%), and beta-blockers and alpha-2 adrenergic agonists 32 (10.1%). Trabeculectomy and medication was 27.3% and trabeculectomy only was 14.6%
17. Phillipin et al.	2021	Selective laser trabeculoplasty versus 0·5% timolol eye drops for the treatment of glaucoma in Tanzania: a randomised controlled trial	Tanzania	Persons diagnosed with chronic high-pressure open-angle glaucoma	Two-arm parallel-group single-masked RCT	201	Treatment was successful in 55 (31%) of 176 eyes in the timolol group (16 [29%] of 55 eyes required repeat administration counselling) and in 99 (61%) of 163 eyes in the SLT group. SLT was superior to timolol eye drops for managing patients with open-angle high-pressure glaucoma for one year in Tanzania

Table 2 (continued)

Author	Year	Study Title	Country	Population	Study Design	Sample size	Summary findings
18. Ezinne et al.	2021	Prevalence and clinical profile of glaucoma patients in rural Nigeria-A hospital-based study	Nigeria	Data for all participants aged 50 years and over who presented for the first time the glaucoma referral centre of the Federal Medical Centre (FMC) Gusau, Zamfara State, Nigeria between, January 2011 and December 2016 (5-year period).	Hospital-based retrospective study of glaucoma participants aged 50 years and above seen over 5 years.	5482 case files were reviewed	995 (18.15%, 95% CI 17.15–19.19%) had glaucoma, particularly primary open-angle glaucoma (11.55%, 95%CI 10.73–12.42%). The high prevalence of glaucoma in older people remains a public health problem in Nigeria
19. Mulinde et al.	2022	Prevalence and risk factors for visual impairment among elderly patients attending the eye clinic a Mulago National Referral Hospital, Uganda: A CS study	Uganda	Individuals aged 60 and above	Cross-sectional study	346	The prevalence of VI among the elderly in Mulago Hospital is high, with the most typical causes being nine treatable conditions, which include cataracts, refractive errors, glaucoma, and corneal opacities
20. Olawoye et al.	2023	Glaucoma Treatment Patterns in Sub-Saharan Africa	Nigeria, Gabon, Cote d'Ivoire, South Africa, Eswatini, and Zimbabwe; Malawi, Ethiopia, Burundi, and Kenya	STAGE study	Ongoing prospective multicentre cross-sectional study	1214 patients from 27 sites in 10 countries	Medical therapy for first-line glaucoma management is preferred by most physicians in SSA (69%) Laser therapy may be underutilized at centres where it is available
21. Olawoye et al.	2024	Patients' Acceptance of Glaucoma Therapy in Sub-Saharan Africa	Nigeria, Gabon, Cote d'Ivoire, South Africa, Eswatini, Zimbabwe, Malawi, Ethiopia, Burundi, and Kenya	Clinical data were collected from eligible participants, which included adult patients aged 18 years or older, newly diagnosed with glaucoma, and naïve to any prior glaucoma treatment, who were seen between July 2018 and January 2022	Multicentre cross-sectional study	1,214 patients at 27 sites in 10 countries with a mean age of 59	Patients' acceptance of glaucoma therapy was high overall, but lower for surgery than for laser or medical therapy. Most patients who declined laser or surgical therapy accepted medical therapy as an alternate therapy when offered

African population for glaucoma prevalence, POAG was diagnosed in 3.1% (95% CI 5 2.5, 3.8%), while PACG and other forms had a prevalence of 0.59% (95% CI 5 0.35, 0.91%) and 0.49% respectively [26]. For the southwestern Nigeria population, POAG was found in 6.2% (95% CI 4.5–7.8%) and primary angle closure glaucoma in 0.2% (95% CI 0.0–0.6%) [25]. One hospital-based study in Nigeria had its prevalence rate of glaucoma high, particularly POAG (11.55%,95% CI 10.73–12.42%), whereas the prevalence of PACG was (3.68, 95%CI 3.22 – 4.22) increased by 15% over 5 years. POAGs were also the most common diagnosis in another study [46].

Although the prevalence of PACG is relatively low compared to POAG, PACG is not uncommon. A study conducted in Ibadan, Nigeria, revealed a prevalence of 9.2% for angle closure with or without glaucoma; another in Tamale, Ghana, had a third of the sample size presenting with PACG [27, 28].

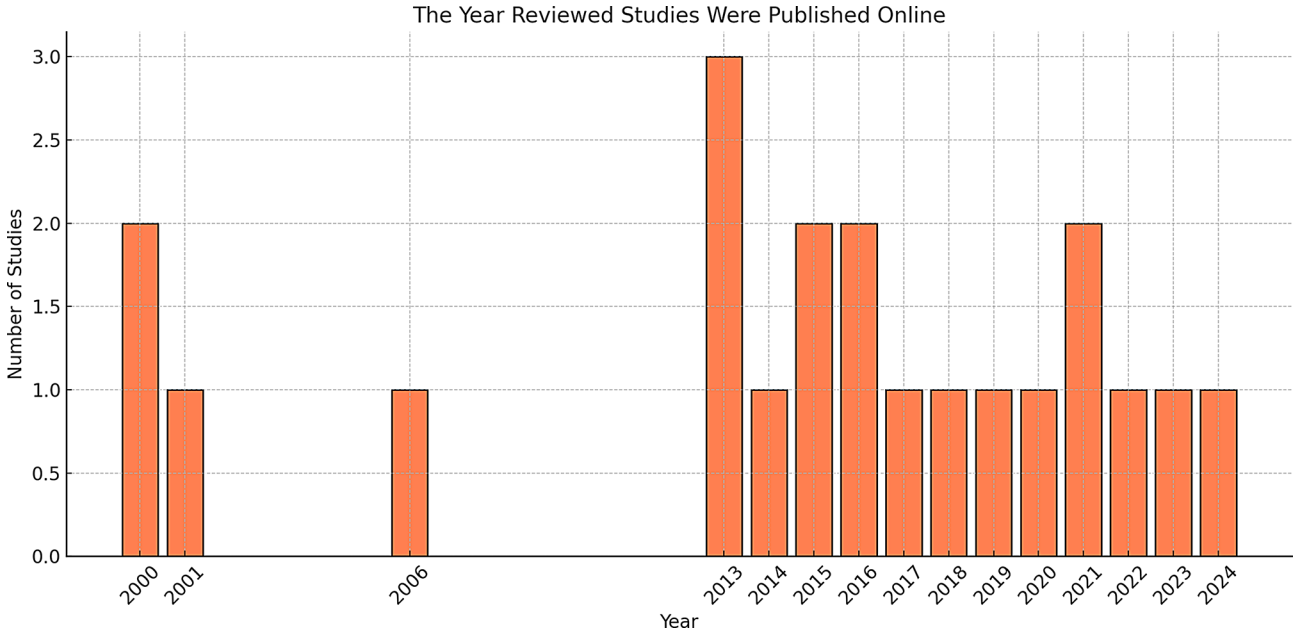

Fig. 2 Pictorial graph showing publication year for included studies

Management options of glaucoma among older adults in SSA

Pharmacotherapy, laser, and surgical treatments are the known management options for glaucoma globally [45]. Pharmacotherapy is usually the first line of treatment due to its availability and lesser risks than laser and surgical treatments [45], which are more cost-effective in the long run and substantially lower IOP over a long period.

For most studies, cost, availability, and accessibility to various treatment options are the main factors that affect glaucoma management. A study on treatment patterns of glaucoma in SSA concluded that medical therapy was the most preferred option by physicians in SSA as it is usually readily available. In contrast, laser therapy was underutilised in centres where it is available [29]. Aside from cost, fear of surgery and fear of going blind were the most common reasons for refusal of glaucoma surgery [34].

A study on the acceptance of glaucoma therapy revealed that in SSA, the acceptance of glaucoma therapy was generally high. In one multicentre study, the acceptance rate for various managements varied, with medical therapy being accepted in 99.2% of eye laser therapy, 88.3%, and surgical therapy in 69.3% [46].

For surgical interventions, trabeculectomy with intraoperative 5-fluorouracil was the most common procedure [32, 35], and in that same multicentre study, the overall number of glaucoma surgeries per ophthalmologist per month was 1. Another study reported a low rate of trabeculectomy of 0.9/ophthalmologist/month [30]. Aside from trabeculectomy, Bogunjoko et al. [36] stated that g-probe and laser trabeculoplasty were the most performed glaucoma surgeries [36]. According to Mwanza & Kabasale [39], using mitomycin-C as a supportive treatment for trabeculectomy in a black population increased its success rate (81.8% compared to 63.6% for eyes not receiving mitomycin-C).

With the low acceptance rates of glaucoma surgeries, there are few studies on laser therapy and its outcomes in SSA. One study found that though less patronised, transscleral diode laser cyclophotocoagulation controlled IOP in almost three-quarters of eyes at 12 months with short-term preservation of vision and minimal complications [41].

According to Philippin et al. [26], selective laser trabeculoplasty is a superior option in managing glaucoma compared to timolol, a low-cost eyedrop often used to manage glaucoma in SSA. SLT provided a success rate of 61%, while timolol had a rate of 31% in the study [30]. A study conducted amongst older adults in South Africa showed that selective laser trabeculoplasty effectively reduced IOP in adults with or without prior medical or surgical antiglaucoma therapy. The study also stated that although all options for glaucoma management are limited in SSA, selective laser trabeculoplasty was the most practical option.

It is worth noting that although various measures are available in developed regions, they are not as common and easily available in the SSA region. The region has limited resources to make all management options readily available.

Policy implications

Government authorities and policymakers must prioritise making resources available to reduce costs and

increase the availability of all management options for glaucoma. Policies and interventions should also include health education and awareness of glaucoma, its prevalence in the region, and the susceptibility of members of the SSA region. Lastly, policies supporting research and data collection on glaucoma prevalence and management are essential since they provide evidence for decision-making and resource allocation.

Limitations

This scoping review has a few limitations. The reliance on only English-language publications may have excluded relevant studies published in other languages, potentially limiting the comprehensiveness of the findings. The variability in study designs, sample sizes, and diagnostic criteria across the included studies makes direct comparisons challenging. Additionally, all the studies reviewed had limitations that could have influenced the determined prevalence rates.

Conclusion

This review confirms that glaucoma is highly prevalent in the SSA subregion and generally increases with age. Although surgical intervention is preferred in most developed countries, the cost involved and fear and anxiety regarding outcomes among the older population in SSA make it a less welcome option. Medical management with eye drops is the most preferred option for this population. Awareness creation and possible inclusion of surgical interventions in the health insurance of developing countries could help improve the acceptance rate for surgical intervention for glaucoma.

Author contributions

J.O.S. and P.Y.A.A. conceptualized the review. E.K.A., P.M., J.O.S. and P.Y.A.A. wrote and analysed the first and final drafts. A.S.P.Q. participated in the consultation stage as an expert reviewer. J.O.S. and P.Y.A.A. supervised the entire writing process. All authors reviewed and approved the final manuscript.

Funding

None.

Data availability

Data and recordings used for this review are within the manuscript.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 19 August 2024 / Accepted: 1 April 2025
Published online: 17 April 2025

References

1. Allison K, Patel D, Alabi O. Epidemiology of glaucoma: the past, present, and predictions for the future. Cureus. 2020;12(11).
2. Kyari F, Ibanga AF, Onakoya AD, Philippin H, Nolan W, Dean W, Zondervan M. Glaucoma-NET: a novel way of improving glaucoma management in sub-Saharan Africa. Eye News. 2022;29(1):30–2.
3. WHO. 2023 https://www.who.int/news-room/fact-sheets/detail/blindness-and-visualimpairment
4. Križaj D. What is glaucoma? Webvision: The Organization of the Retina and Visual System [Internet]. 2019 May 30.
5. Babalola TK, Moodley I. Assessing the efficiency of health-care facilities in Sub-Saharan Africa: a systematic review. Health Serv Res Managerial Epidemiol. 2020;7:2333392820919604.
6. Kyari F, Entekume G, Rabiu M, Spry P, Wormald R, Nolan W, Nigeria National Blindness and Visual Impairment Study Group. A Population-based survey of the prevalence and types of glaucoma in Nigeria: results from the Nigeria National blindness and visual impairment survey. BMC Ophthalmol. 2015;15:1–15.
7. Ocansey S, Antiri EO, Abraham CH, Abu EK. Dry eye symptom questionnaires show adequate measurement precision and psychometric validity for clinical assessment of vision-related quality of life in glaucoma patients. PLoS ONE. 2023;18(3):e0283597.
8. Salowe RJ, Chen Y, Zenebe-Gete S, Lee R, Gudiseva HV, Di Rosa I, Ross AG, Cui QN, MillerEllis E, Addis V, Sankar PS. Risk factors for structural and functional progression of primary open-angle glaucoma in an African ancestry cohort. BMJ Open Ophthalmol. 2023;8(1):e001120.
9. Dean WH, Buchan JC, Gichuhi S, Faal H, Mpyet C, Resnikoff S, Gordon I, Matende I, Samuel A, Visser L, Burton MJ. Ophthalmology training in sub-Saharan Africa: a scoping review. Eye. 2021;35(4):1066–83. https://doi.org/10.1038/s41433-020-01335-7.
10. Falchetta G, Hammad AT, Shayegh S. Planning universal accessibility to public health care in sub-Saharan Africa. Proc Natl Acad Sci. 2020;117(50):31760–9.
11. Swaminathan SS, Medeiros FA. Socioeconomic disparities in glaucoma severity at initial diagnosis: A nationwide electronic health record cohort analysis. Am J Ophthalmol. 2024;263:50–60.
12. Sengo DB, Marraca NA, Muaprato AM, García-Sanjuan S, Caballero P, López-Izquierdo I. Barriers to accessing eye health services in suburban communities in Nampula, Mozambique. Int J Environ Res Public Health. 2022;19(7):3916.
13. Olawoye OO, Fawole O, Ashaye AO, Chan VF, Azuara-Blanco A, Congdon N. Effectiveness of community outreach screening for glaucoma in improving equity and access to eye care in Nigeria. Br J Ophthalmol. 2023;107(1):30–6.
14. Delgado MF, Abdelrahman AM, Terahi M, Miro Quesada Woll JJ, Gil-Carrasco F, Cook C, Benharbit M, Boisseau S, Chung E, Hadjiat Y, Gomes JA. Management of glaucoma in developing countries: challenges and opportunities for improvement. ClinicoEconomics and outcomes research. Sep. 2019;27:591–604.
15. Dietlein TS, Rosentreter A. [Surgical options in glaucoma management]. Klin Monatsbl Augenheilkd. 2018;235(9):1013–20. https://doi.org/10.1055/S-0043-106297.
16. Mailu EW, Virendrakumar B, Bechange S, Jolley E, Schmidt E. Factors associated with the uptake of cataract surgery and interventions to improve uptake in low-and middleincome countries: A systematic review. PLoS ONE. 2020;15(7):e0235699.
17. Cicinelli M, Marmamula S, Khanna R. Comprehensive eye care - Issues, challenges, and way forward. Indian J Ophthalmol. 2020;68(2):316.
18. Coleman AL, Miglior S. Risk factors for glaucoma onset and progression. Surv Ophthalmol. 2008;53(6):S3–10. https://doi.org/10.4103/IJO.IJO_17_19.
19. Mcmonnies CW. The potential role of neuropathic mechanisms in dry eye syndromes. J Optometry. 2017;10(1):5–13.
20. Adebowale AS, Onwusaka O, Salawu MM, Bello S, Adewole DA. Ageing in sub-Saharan Africa: demographic and historical perspectives. In: Odimegwu CO, Adewoyin Y, editors. The Routledge handbook of African demography. Routledge; 2022. p. 679–703.
21. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005;8(1):19–32.
22. Mulinde B, Atukunda I, Kawooya I, Sebabi FO, Mukunya D, Batte C…OtiSengeri, J. Prevalence and risk factors for visual impairment among elderly patients attending the eye clinic at Mulago National referral hospital, Uganda: a cross-sectional study. Afr Health Sci. 2022;22(2):124–32.

23. Adegbehingbe BO, Fajemilehin BR, Ojofeitimi EO, Bisiriyu LA. Blindness and visual impairment among the elderly in Ife-Ijesha zone of Osun State, Nigeria. Indian J Ophthalmol. 2006;54(1):59–62.
24. Ezinne NE, Ojukwu CS, Ekemiri KK, Akano OF, Ekure E, Osuagwu UL. (2021). Prevalence and clinical profile of glaucoma patients in rural Nigeria—A hospital-based study. PLoS ONE 2021;16(12):e0260965.
25. Ashaye A, Ashaolu O, Komolafe O, Ajayi BG, Olawoye O, Olusanya B, Adeoti C. Prevalence and types of glaucoma among an Indigenous African population in Southwestern Nigeria. Investig Ophthalmol Vis Sci. 2013;54(12):7410–6.
26. Buhrmann RR, Quigley HA, Barron Y, West SK, Oliva MS, Mmbaga BB. Prevalence of glaucoma in a rural East African population. Investig Ophthalmol Vis Sci. 2000;41(1):40–8.
27. Olawoye OO, Sarimiye TS. Is angle closure glaucoma a problem in Nigeria? Niger J Clin Pract. 2014;17(2):159–62.
28. Liu CK, Ali O, Murdoch I, Simon J. Proportion of angle closure glaucoma in Tamale, Ghana. J Glaucoma. 2024;33(9):709–14.
29. Olawoye O, Washaya J, Gessesse GW, Balo K, Agre J, Macheka B, STAGE Research Group. Glaucoma treatment patterns in Sub-Saharan Africa. J Glaucoma. 2023;32(10):815–9.
30. Philippin H, Matayan E, Knoll KM, Macha E, Mbishi S, Makupa A, Burton MJ. Selective laser trabeculoplasty versus 0· 5% timolol eye drops for the treatment of glaucoma in Tanzania: a randomised controlled trial. Lancet Global Health. 2021;9(11):e1589–99.
31. Goosen E, Coleman K, Visser L, Sponsel WE. Racial differences in selective laser trabeculoplasty efficacy. J Curr glaucoma Pract. 2017;11(1):22.
32. Strutton D, Walt J. Trends in glaucoma surgery before and after introduction of new topical glaucoma pharmacotherapies. J Glaucoma. 2004;13:221–6.
33. Kizor-Akaraiwe NN, Ogbonnaya CE. Practice of trabeculectomy by ophthalmologists in Nigeria. Niger J Clin Pract. 2017;20(5):507–11.
34. Adekoya BJ, Akinsola FB, Balogun BG, Balogun MM, Ibidapo OO. Patient refusal of glaucoma surgery and associated factors in Lagos, Nigeria. Middle East Afr J Ophthalmol. 2013;20(2):168–73.
35. Adekoya BJ, Onakoya AO, Shah SP, Adepoju FG. Surgical output and clinic burden of glaucoma in Lagos, Nigeria. J Glaucoma. 2014;23(1):41–5.
36. Bogunjoko T, Hassan A, Ogunro A, Akanbi T, Ulaikere M, Ashaye A. Trends in glaucoma procedures and surgeries at the eye foundation hospital group, Nigeria. Niger J Clin Pract. 2019;22(11):1606–10.
37. Anand N, Mielke C, Dawda VK. Trabeculectomy outcomes in advanced glaucoma in Nigeria. Eye. 2001;15(3):274–8.
38. De Smedt SK, Fonteyne YS, Muragijimana F, Palmer K, Murdoch I. Glaucoma surgery outcome in Rwanda. J Glaucoma. 2016;25(8):698–703.
39. Mwanza JC, Kabasele PM. Trabeculectomy with and without mitomycin-C in a black African population. Eur J Ophthalmol. 2001;11(3):261–3.
40. Gessesse GW. The Ahmed glaucoma valve in refractory glaucoma: experiences in Southwest Ethiopia. Ethiop J Health Sci. 2015;25(3):267–72.
41. Abdull MM, Broadway DC, Evans J, Kyari F, Muazu F, Gilbert C. Safety and effectiveness of primary transscleral diode laser cyclophotoablation for glaucoma in Nigeria. Clin Exp Ophthalmol. 2018;46(9):1041–7.
42. Kyari F, Adekoya B, Abdull MM, Mohammed AS, Garba F. The current status of glaucoma and glaucoma care in sub-Saharan Africa. Asia-Pacific J Ophthalmol. 2018;7(6):375–86.
43. Budenz DL, Barton K, Whiteside-de Vos J, Schiffman J, Bandi J, Nolan W, Tema Eye Survey Study Group. Prevalence of glaucoma in an urban West African population: the Tema eye survey. JAMA Ophthalmol. 2013;131(5):651–8.
44. Leske MC, Connell AMS, Schachat AP, Hyman L. The Barbados eye study: prevalence of open angle glaucoma. Arch Ophthalmol. 1994;112(6):821–9.
45. Wagner IV, Stewart MW, Dorairaj SK. Updates on the diagnosis and management of glaucoma. Mayo Clin Proceedings: Innovations Qual Outcomes. 2022;6(6):618–35.
46. Olawoye O, Sarimiye T, Washaya J, Gessesse GW, Balo K, Agre J, STAGE Research Group. Patients' acceptance of glaucoma therapy in sub-Saharan Africa. J Glaucoma. 2024;33(12):951–6.

Publisher's note