Research Article

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Rapid Assessment of Avoidable Visual Impairment and Blindness in Togo

AYENA Koffi Didier[1]*, PREMPE Yawo Sefofo[2], AGNEGUE Essy Sakya Gracia[1], SETONDJI Yao Sena Valentin[1], ABALO Kodjo Evenyo[1], YEKPLE Kwami Amenuveve[1], LAWSON Late Fabrice[1], DJAGBE Donko Raoul[1], SANTOS Mawuli Ayodélé Komi[1], DJABABONI Yendjelé Adjissi[1], GONCALVES Kossi Senyo[1], AKAKPO Adjowa[1], GASSA GBEGNON Modoukpè[1], NAYO Komlan Ouviaboué[1], AMEDOME Kokou Messan[3], VONOR Kokou[3], MANEH Nidain[1], DZIDZINYO Kossi[1] and Joseph Oye ENYEGUE[4]

[1]*Faculty of Health Sciences, University of Lomé, Togo.*

[2]*Coordination of the National Eye Health Program, Togo.*

[3]*Faculty of Health Sciences, University of Kara, Togo.*

[4]*Sight Savers, Cameroon.*

***Correspondence:**

Dr. AYENA Koffi Didier, Senior Professor of Ophthalmology, Faculty of Health Sciences of the University of Lomé, Togo, Tel: +228 90 11 59 63/ 99628162.

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ABSTRACT

Objective: *This study aims to describe the epidemiology and management of blindness and visual impairment (VI) in Togo in order to plan appropriate interventions.*

Patients and Methods: *This was a standardized prospective descriptive cross-sectional cluster survey based on population size conducted in September and November 2024 following the Rapid Assessment of Avoidable Blindness (RAAB) version 7 methodology. Each person aged 50 years and above who gave consent underwent a brief ophthalmic examination and an interview on barriers to cataract surgery causing blindness.*

Results: *A total of 8,016 people were examined out of the 8,150 planned, representing a participation rate of 98.35%. Distance visual impairment was bilateral in 40.83% (n = 3,273), with a blindness rate of 4.26% (n = 342), and unilateral in 18.54% (n = 486), with a unilateral blindness rate of 2.67% (n = 214). Near visual impairment was observed in 76.91% (n = 6,165), with an effective coverage rate of reading glasses of 0.3% (n = 20). The main causes of bilateral blindness were untreated cataract in 64.62%, followed by glaucoma at 13.16%. The effective cataract surgical coverage rate (eCSC) was 16.63%. The three main barriers to cataract surgery were cost (33.06%), lack of awareness of available treatment (27.25%), and inability to access surgery (19.05%). Refractive errors were observed in 15.74% (n = 1,262), with an effective refractive error coverage rate (eREC) of 1.58%.*

Conclusion: *The RAAB7 survey in Togo showed that the prevalence of bilateral blindness remains high, with low rates of effective coverage. It is urgent that eye health actions be strengthened and expanded in order to achieve improvement in these indicators.*

Keywords

Epidemiology, Blindness, Visual impairment, RAAB7, Togo.

Introduction

Visual impairment and blindness correspond respectively to a visual acuity of less than 6/12 and 3/60 with best correction worn. In 2020, it was estimated that 43 million people were blind and 295 million people were living with moderate or severe visual impairment. In total, 596 million people were living with distance visual impairment [1]. According to the Vision Atlas of the International Agency for the Prevention of Blindness (IAPB) [2], 90% of vision loss is avoidable, and the main global causes of blindness, across all ages, were untreated cataract (17 million),

uncorrected refractive errors (4 million), and glaucoma (4 million). The main causes of moderate to severe visual impairment or low vision, across all ages, in 2020 were uncorrected refractive errors (160 million), untreated cataract (83 million), age-related macular degeneration (6 million), glaucoma (4 million), and diabetic retinopathy (1 million).

Approximately 90% of visual impairments worldwide are avoidable, meaning that public health interventions aimed at addressing avoidable vision loss are a priority. It is estimated that 55% of blind people and those with moderate or severe visual impairment are women, and that the vast majority (86%) are aged 50 years and above.

The great majority of people with visual impairment (90%) live in low- and middle-income countries [3].

The objective of this study was to conduct a Rapid Assessment of Avoidable Blindness (RAAB7) survey among people aged 50 years and above in Togo in order to estimate the magnitude and causes of blindness and visual impairment and to provide information that will be used to design effective services.

Patients and Methods

The RAAB 7 is a standardized, prospective, descriptive, population-based cross-sectional survey. It was conducted from September 9 to 26, 2024, in the southern region, and from November 18 to December 7, 2024, in the rest of the country.

Togo is a West African country bordered to the west by Ghana, to the east by Benin, to the north by Burkina Faso, and to the south by the Gulf of Guinea (Figure 1).

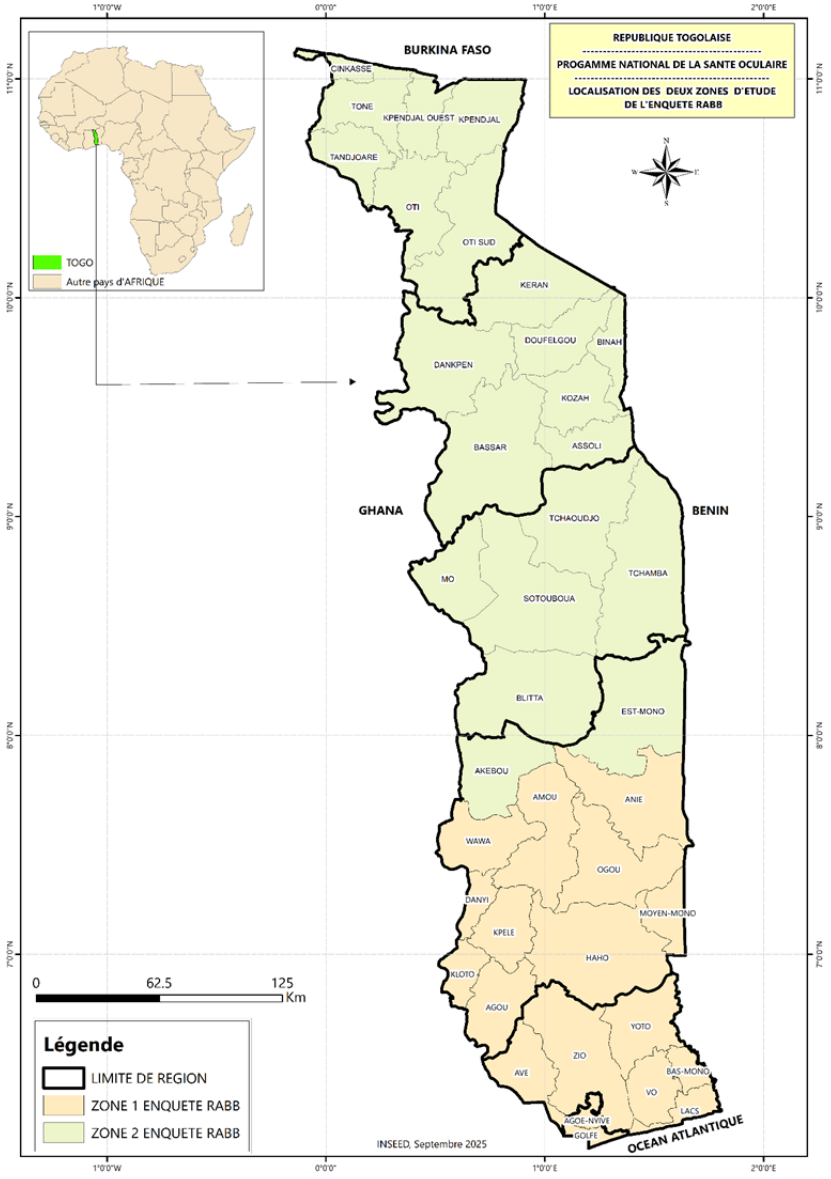

Figure 1: Map of Togo showing the two RAAB7 survey sites.

Demographically, Togo's resident population was 8,095,498 according to the fifth general population and housing census (RGPH-5) of 2022, of which 51.3% were women and 48.7% men. The country covers an area of 56,600 km square. The average annual population growth rate slightly decreased from 2.9% in 2010 to 2.3% in 2022. Monetary poverty, traditionally assessed through household income or expenditure, has limitations in contexts where the majority of the population is rural, with a predominance of subsistence farming and informal economy [4].

Sampling and survey design: The sample was constructed following cluster survey procedures. This was a standardized, prospective, descriptive, population-based cluster survey conducted according to the Rapid Assessment of Avoidable Blindness (RAAB) version 7 methodology of the London School of Hygiene and Tropical Medicine (LSHTM) among individuals aged 50 years and above [5,6].

RAAB7 surveys are conducted in areas where the general population does not exceed 5 million. Therefore, the country was divided into two survey zones (Figure 1). From the list of villages and their populations, villages that could contain at least one cluster of 50 people aged 50 years and above were selected in each zone. The list of eligible villages was entered into the appropriate software, which randomly selected 163 enumeration areas. The statistics department provided maps of each enumeration area with population sizes. Based on these data, the probable number of clusters per enumeration area was estimated. At the enumeration area, segments theoretically containing a cluster were demarcated on the map, numbered, and two segments were randomly drawn by a female member of the village chief's household. The survey team started at the first randomly selected segment under the guidance of a community health worker, recruiting all residents aged 50 years and above who had lived in the household for at least six months. After explaining the examination procedures, informed consent was obtained.

Distance visual acuity was measured using the Peek Vision Acuity tool at a distance of three meters. A systematic anterior segment examination (eyelids, eyelashes, conjunctiva, cornea, pupillary area) was performed using a flashlight, and fundus examination was conducted with a direct ophthalmoscope. For participants presenting visual impairment, a questionnaire was administered to assess the availability of appropriate eye care services and identify causes and barriers to care. Participants who had undergone cataract surgery were asked about the location and quality of the procedure.

Distance visual impairment categories were defined according to the visual acuity thresholds of the World Health Organization International Classification of Diseases (ICD-11) [7] as mild ($6/12 < VA \geq 6/18$), moderate ($6/18 < VA \geq 6/60$), severe ($6/60 < VA \geq 3/60$), and blindness ($VA < 3/60$).

A research protocol and four action guides were developed for data collection personnel, who underwent prior training. Five survey teams were formed, each including an ophthalmologist, a senior ophthalmology technician, and a data entry operator. All procedures followed RAAB7 guidelines [6], with an inter-observer variation coefficient of 68%.

Data were collected using tablets with a customized Android application developed by the International Centre for Eye Health (ICEH) and Peek Vision, with automatic encrypted transfer to a secure Amazon Web Services (AWS) cloud server. Anonymized datasets and survey reports were uploaded to the RAAB7 repository at LSHTM via Android devices using RAAB7 applications.

The survey protocol was approved by the Bioethics and Scientific Research Committee (CBRS) of the Ministry of Health and Public Hygiene. All procedures adhered to ethical and professional research standards. The authors declare no conflicts of interest regarding the materials and equipment cited in this study. Participants with eye conditions other than acute conjunctivitis were referred to the nearest ophthalmology service for appropriate care. All tests were conducted free of charge, funded by BMZ and CBM. Collected data were kept confidential.

Results

At the end of the study, 8,150 individuals had been enumerated across the 163 clusters, of whom 8,016 were fully examined, representing a participation rate of 98.35%. There were 16 refusals (0.20%), 53 individuals unable to participate (0.65%), and 65 unavailable participants (0.80%).

The 50–59 age group was the most represented, accounting for 42.83%, with a female predominance of 65.07%, corresponding to a sex ratio of 0.53. It was noted that the number of individuals decreased progressively with increasing age (Table 1).

Table 1: Distribution of participants by age and sex.

	Female		Male		Total	
	N	*%*	*N*	*%*	*N*	*%*
50-59	2187	41.93	1246	44.50	3433	42.83
60-69	1593	30.54	884	31.57	2477	30.90
70-79	904	17.33	479	17.11	1383	17.25
80+	532	10.20	191	6.82	723	9.02
Total	5216	100.0	2800	100.0	8016	100.0

Bilateral visual impairment was observed in 3,273 individuals (40.83%), with a blindness rate of 4.26%. Low vision, combining moderate and severe visual impairments, was observed in 2,040 participants, representing 25.45% of those surveyed (Table 2).

Unilateral visual impairment was observed in 919 women and 567 men, totaling 1,486 individuals (18.54%), with unilateral blindness observed in 214 participants (2.67%). A consistent female predominance was noted. Unilateral low vision was observed in 595 individuals (7.42%) (Table 3). Extrapolating to the study population, bilateral blindness would affect approximately

33,006 individuals, and unilateral blindness approximately 24,582 individuals.

Near visual impairment was observed in 6,165 individuals, representing a prevalence of 76.91%, including 4,218 women (68.41%) and 1,947 men (31.59%), corresponding to a sex ratio of 0.46. Only 240 participants presented their reading glasses during the survey. The coverage rate for near visual impairment was 3.89%. Only 20 individuals had glasses that allowed proper near vision, corresponding to an effective coverage rate for near vision glasses of 0.3%.

The main causes of bilateral blindness were untreated cataract (64.62%), followed by glaucoma (13.16%). According to the results summarized in (Table 4), the two main causes of low vision were cataract (n = 1,103; 54.07%) and refractive errors (n = 569; 27.89%). The causes of blindness were observed in 237 women (69.30%) and 105 men (30.70%), giving a sex ratio of 0.44. Bilateral blindness was curable in 64.91% of cases and avoidable in 90.93% of cases. Bilateral blindness due to cataract was found in 147 women and 32 men, totaling 179 individuals not yet treated, corresponding to 15,633 blind individuals in the general population (Table 5).

Table 2: Prevalence of bilateral visual impairment (VI) categories and blindness by sex.

	Female			Male			Total		
	N	*%*	95% IC	*N*	*%*	*95% CI*	*N*	*%*	95% CI
Blindness	237	4.5	4.0 - 6.4	105	3.75	3.4 - 5.3	342	4.26	4.0 - 5.7
Severe VI	381	7.30	6.7 - 9.1	133	4.75	3.4 - 5.5	514	6.41	5.7 - 7.6
Moderate VI	1104	21.16	18.8 - 22.7	422	15.07	13.1 - 17.1	1526	19,03	17.2 - 20.2
Mild VI	635	12.17	10.2 - 12.6	256	9.14	7.8 - 10.7	891	11.11	9.6 - 11.6

Table 3: Unilateral visual impairment by sex.

	Female			Male			Total		
	N	*%*	*95% CI*	N	*%*	*95% CI*	*N*	*%*	*95% CI*
Blindness	115	2.20	1.5 - 2.6	99	3.53	3.0 - 5.2	214	2.67	2.2 - 3.3
Severe VI	57	1.09	0.9 - 1.7	31	1.11	0.7 - 1.7	88	1.09	1.0 - 1.6
Moderate VI	300	5.75	4.9 - 7.0	207	7.39	5.4 - 8.1	507	6.32	5.4 - 7.1
Mild VI	447	8.57	7.3 - 9.7	230	8.21	7.2 - 10.3	677	8.45	7.6 - 9.6

Table 4: Distribution of the causes of visual impairments.

	Blindness		**Severe VI**		**Moderate VI**		**Mild VI**	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Refractive Error	1	0.29	46	8.95	523	34.29	651	73.1
Cataract	221	64.62	317	61.7	786	51.54	183	20.5
Cataract Surgery Complications	18	5.26	16	3.11	25	1.64	6	0.67
Trachomatous Corneal Opacity	0	0	1	0.19	0	0	1	0.11
Other Corneal Opacity	24	7.02	9	1.75	6	0.39	1	0.11
Pterygium	1	0.29	3	0.58	19	1.24	9	1.01
Phthisis	1	0.29	0	0	0	0	0	0
Glaucoma	45	13.16	7	1.36	11	0.5	5	0.56
Diabetic retinopathy	0	0	2	0.39	2	0.13	0	0
Age-related Macular Degeneration	1	0.29	1	0.19	1	0.06	1	0.11
Other Posterior Segment Disease	26	7.6	98	19.1	140	9.18	28	3.14
Degenerative Myopia	0	0	5	0.3	3	0.19	1	0.11
Other Globe Abnormalities or CNS	4	1.17	9	1.75	9	0.59	5	0.56
Total	342	100	514	100	1525	100	891	100

Table 5: Unmet Need for Cataract Surgery at Pinhole Visual Acuity Thresholds <3/60, <6/60, <6/18, and <6/12.

	Female			**Male**			**Total**		
	N	*%*	95% CI	*N*	*%*	95% CI	*N*	*%*	95% CI
AVTS <3/60	147	2.82	2.5 - 3.7	32	1.14	0.8 - 1.8	179	2.23	1.8 - 2.6
AVTS <6/60	265	5.08	4.7 - 6.0	74	2.64	1.8 - 3.2	339	4.23	3.4 - 4.4
AVTS <6/18	767	14.70	10.2 - 14.0	235	8.39	5.9 - 9.0	1002	12.5	11.1 - 14.0
AVTS <6/12	1057	20.26	18.3 - 23.4	354	12.64	10.7 - 15.0	1411	17.60	16.1 - 20.2

Extrapolating to the general population, 14,145 and 44,271 people would have visually significant cataract in both eyes and in one eye, respectively (Figure 2). This corresponds to 72,561 cases of visually significant cataract among individuals aged 50 years and above in the country as of December 2024.

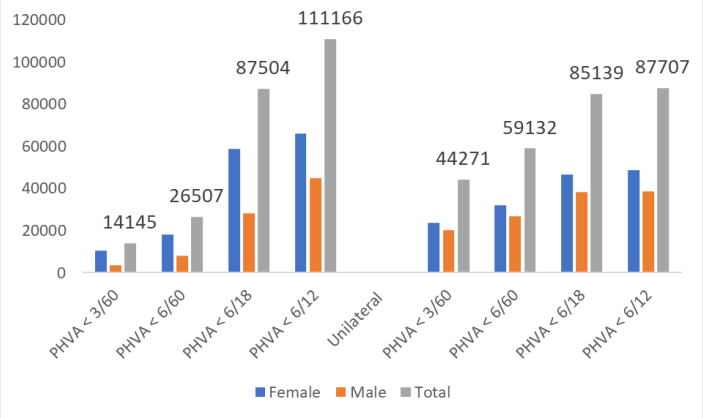

Figure 2: Magnitude of bilateral and unilateral cataract in the general population by visual acuity threshold and sex.

Two hundred fifteen (215) individuals, including 136 women and 79 men, had undergone cataract surgery in both eyes, representing 2.68%. Two hundred ninety-four (294) individuals, including 176 women and 118 men, had cataract surgery in one eye. In total, 509 individuals, including 312 women (61.30%) and 197 men (38.70%), had been operated on. Cataract surgery involved intraocular lens implantation in 96.02% of cases. Among those operated on for cataract, 26.33% had good vision without correction, which increased to 48.83% with a pinhole test (Figure 3). The cataract surgical coverage (CSC) rate, using a pinhole visual acuity threshold of ≥6/12, was 34.06%, while the effective cataract surgical coverage (eCSC) rate was 16.63%. Cataract surgeries were performed in a public center in 57.17% of cases, during outreach cataract camps in 22.42%, in confessional centers in 13.01%, and in private centers in 7.40% (Figure 4).

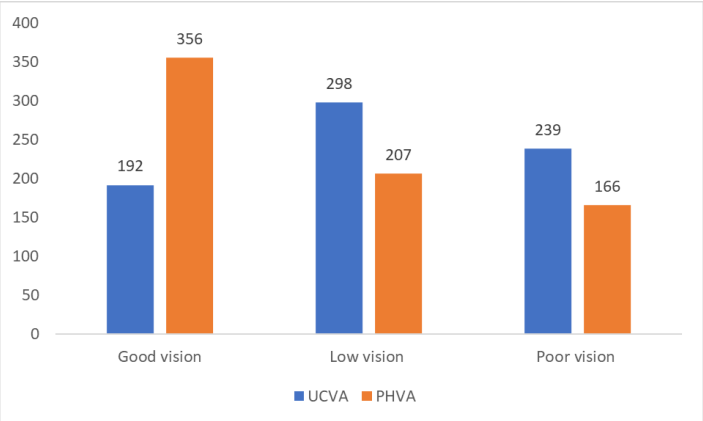

Figure 3: Functional outcomes of operated eyes without correction and with pinhole visual acuity.
UCVA = Uncorrected Visual Acuity; PHVA= Pin Hole Visual Acuity.

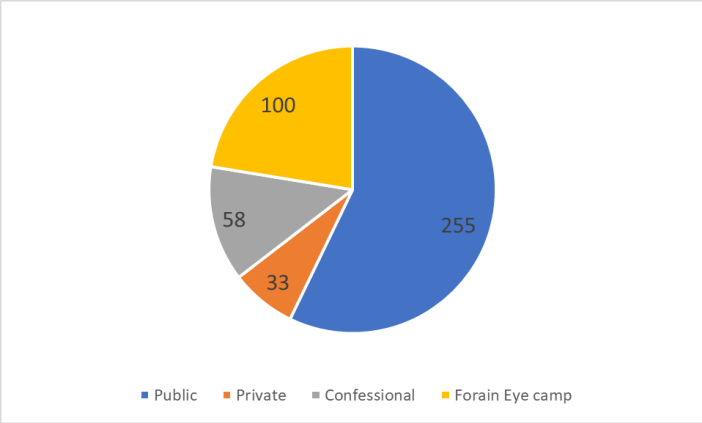

Figure 4: Distribution of cataract-operated patients by surgical site.

The three main barriers to cataract surgery were cost (33.06%), lack of awareness of available treatment (27.25%), and inability to access surgery (19.05%). These barriers were observed in 81.75% of women (Table 6). Refractive errors were observed in 882 women (16.91%) and 380 men (13.57%), totaling 1,262 individuals, corresponding to a prevalence of 15.74%. Only 244 individuals had corrective glasses. The need for optical correction was unmet in 80.67% of cases. The refractive error coverage (REC) rate was 19.33%, and the effective refractive error coverage (eREC) rate was 1.58% for a pinhole visual acuity threshold of ≥6/12.

Table 6: Barriers to Cataract Surgery Among Participants with Bilateral Cataract and Pinhole Visual Acuity (PVA) <6/60.

	Female		Male		Total	
	N	*%*	*N*	*%*	*N*	*%*
Cost	101	32.68	24	34.78	125	33.06
Fear	26	8.41	7	10.14	33	8.73
Unaware of Available Treatment	85	27.51	18	26.09	103	27.25
Impossible Access to surgery	56	18.13	16	23.19	72	19.05
Perceived no need	19	6.15	2	2.90	21	5.55
Others	18	5.82	2	2.90	20	5.29
Surgery Refused by the Facility	4	1.30	0	0.0	4	1.06
Total	309	100.0	69	100.0	378	100.0

Discussion

The RAAB7 provides population-based representative estimates of the prevalence and causes of blindness and visual impairment, as well as data on existing eye care service indicators. These data are essential for evidence-based eye care planning that meets the community's eye health needs in the country. To date, there are no recent epidemiological data on visual impairment and its causes in Togo, and national estimates are over a decade old.

These outdated data no longer reflect the current situation due to demographic changes and the mismatch between growing demand and available eye care services. The National Eye Health Program obtained funding from BMZ (Federal Ministry for Economic Cooperation and Development) and the Christian Blind Mission

(CBM) to conduct such a survey in 2024. These data will thus support the development of a national strategic eye health plan.

RAAB7 is a widely used standardized survey method in global eye health to assess the burden of blindness and visual impairment for the purpose of planning and promoting eye care services [5,6]. It focuses on blindness and visual impairment in the population aged 50 years and above, as the higher prevalence in this age group allows for a smaller sample size compared with a survey of the entire population. The causes of blindness in this age group can be considered representative of the population across all ages [5]. A smaller sample, combined with a simplified examination protocol, means the survey can be conducted relatively quickly and at lower cost compared with conventional surveys. RAAB7 is an end-to-end method, supported by custom software, which enables standardized calculation of sample size, cluster selection, automated analysis, and results generation.

The latest version of the RAAB methodology (RAAB7) uses paperless mobile data entry connected to a cloud-hosted web system accessible via a web browser. It was developed by ICEH and Peek Vision [5] with support from several funders. Users do not need to install software or manage databases. The dashboards for ongoing surveys provide a real-time overview of survey progress and completeness, and allow frequent review of inconsistencies in data entry [5].

RAAB7 includes measurement of uncorrected visual acuity (UCVA) as well as corrected visual acuity for those wearing distance vision correction. Current visual acuity with correction worn (based on WHO visual impairment categories) is derived from these two measurements. This update is in line with WHO recommendations and allows calculation of met needs for refractive error correction and effective refractive error coverage (eREC) [7].

The objective of this study was to identify the current challenges in managing blindness in Togo among the population aged 50 years and above, and more specifically to estimate the prevalence and main causes of bilateral blindness affecting populations in Togo. The RAAB7 survey is a rapid survey methodology usually conducted at the subnational level. The exact number of participants depends on the estimated prevalence of blindness and other sampling parameters. Survey teams received one week of standardized training provided by a certified RAAB trainer, enabling standardized analysis to determine the prevalence, causes of blindness and visual impairment, and existing indicators in eye care services. These data are essential for evidence-based eye care planning that is responsive to community needs.

The age- and sex-adjusted prevalence of blindness among people aged 50 years and above was 4.26%. Our results are consistent with those of Traoré et al. in Mali in 2023 [8] and Jolley et al. in Saint Louis, Senegal, in 2023 [9], who, using the same method, reported prevalences of 3.1% and 3.6–5.2%, respectively. The gender-specific prevalence in our study shows a predominance of bilateral blindness among women (4.5%) compared with men (3.75%). These results suggest that eye care services, with support from the National Eye Health Program (PNSO) in Togo, have contributed to preventing a significant increase in the number of patients with blindness. Furthermore, the "zero cataract" program implemented by the Togolese government has helped reduce the prevalence of blindness in the country.

Cataract, followed by glaucoma, remain the leading causes of bilateral blindness in Togo, accounting for 64.62% and 13.16%, respectively. All authors agree that cataract is the primary cause of bilateral blindness. For example, Jolley et al. [9] reported cataract as the leading cause of blindness (56.3%–66.3%), and Traoré et al. [8] in Mali noted cataract as the main cause of blindness in both regions—67.1% in Ségou and 57.8% in Sikasso—with glaucoma being the second leading cause in Ségou (18.8%) and Sikasso (16.9%).

The three main barriers to surgery for visually significant cataract were cost (33.06%), lack of awareness of available treatment (27.25%), and inability to access surgery (19.05%). These barriers were observed in 81.75% of women (Table 6). Despite the increase in secondary care centers, most studies identify financial constraints and fear of surgery as the main obstacles to cataract surgery in developing countries. Banla et al. [10] in Togo in 2007, in a survey conducted in a rural area in northern Togo, reported lack of financial resources (68.4%), inadequate information (60.5%), and relatively better vision in the less-affected eye as the main barriers to surgery. Evina et al. [11] in Cameroon in 2023, in their study on barriers to cataract surgery at Magrabi, reported that the high cost of surgery is the principal obstacle. However, Jolley et al. [9] found that the most common reasons were lack of awareness of the possibility of treatment—29.3% in Fatick and 35.1% in Kaolack—followed by inability to pay for the operation—23.7% in Fatick and 30.7% in Kaolack.

The cataract surgical coverage (CSC) rate, using a pinhole visual acuity threshold of ≥6/12, was 34.06%, while the effective cataract surgical coverage (eCSC) rate was 16.63%. Cataract surgery was performed in a public center in 57.17% of cases. According to a meta-analysis of RAAB studies published by McCormick et al. [12], the effective cataract surgical coverage in Africa is 14% and 15% in low-income countries. The same authors reported an eCSC of 61% in high-income countries in 2022 [13]. This highlights that Togo must continue its efforts to approach such coverage rates. Additionally, it should be noted that the population was treated in public hospitals, which helps strengthen the eye care infrastructure in these hospitals and increase their service capacity.

The effective refractive error coverage in our study was 1.58%. According to Bourne et al. [14], eREC (6/12) in Africa is 12% and 15% in low-income countries. This indicator is 92% in high-income countries and 80% in the USA. Our low eREC can be explained by insufficient refractive services, the fact that most cataract surgeries used standard intraocular lenses without ocular

biometry, limited availability of lens powers, infrequent refraction sessions for cataract-operated patients, and the population's financial limitations in acquiring glasses.

Conclusion

The RAAB7 survey in Togo provided reliable data on blindness, collected for the second time in the country. It shows that the prevalence of bilateral blindness (4.26%) remains high despite the eye health interventions implemented in Togo. Cataract and glaucoma are the main causes of bilateral blindness in the country. Cost, lack of awareness of treatment, and limited access to eye care services remain major challenges in managing bilateral blindness among the population aged 50 years and above. The effective coverage rates for cataract surgery (6/12) and refractive errors were 16.63% and 1.58%, respectively. It is urgent that eye health actions be strengthened and expanded to the entire population in order to achieve improvements in these indicators.

Acknowledgments

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