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Original article

Social determinants of health associated with blindness due to glaucoma in an eastern Cuban population

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ABSTRACT

To work on the prevention of blindness due to glaucoma, the influence of social determinants on its evolution and prognosis must be taken into account. The aim of the research was to establish the association between social determinants of health and blindness due to glaucoma. An analytical case-control study was conducted in Las Tunas in

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2024. The study group consisted of 114 patients with blindness due to glaucoma and the control group of 228 patients with glaucoma without blindness. The variables studied were: biological factors (age, sex, ethnicity, family history of glaucoma, concomitant systemic diseases), lifestyles, and economic situation. Absolute and relative frequency analysis was performed, and Chi-square and Fisher's exact test were used to establish the association between social determinants of health and blindness due to glaucoma. The social determinants of health influencing the occurrence of blindness due to glaucoma were: age over 50 years, family history of glaucoma, presence of arterial hypertension and diabetes mellitus, failure to perform recommended eye care, history of exposure to occupational conditions with visual risk, non-adherence to treatment, irregularity in periodic ophthalmological check-ups, low educational level, and residence in rural areas. Socio-health strategies are needed to change the environment of the social determinants that influence the progression to blindness due to glaucoma, taking into account associated diseases such as arterial hypertension and diabetes mellitus, as well as more favorable lifestyles.

Keywords: Glaucoma; Blindness; Visual disability; Social determinants of health.

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Introduction

Health has been the subject of multiple conceptualizations throughout history. The World Health Organization (WHO) describes it as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” However, various studies

show that the best health indicators are achieved when there is political will to support and guide actions in this area. (1)

Inequalities in contemporary development have a negative and disproportionate impact on the most vulnerable communities. (2) In this context, the 2030 Agenda for Sustainable Development establishes 17 goals and 169 interrelated targets that encompass economic, social, and environmental dimensions (2023). (3) Likewise, the 2020 United Nations General Assembly report on “Integrated, person-centered eye care, including preventable blindness and visual impairment” (WHO, 2020) recognizes the importance of eye health and sets out seven strategic objectives. (4)

Glaucoma is defined as a group of diseases characterized by multifactorial optic neuropathy, which damages the optic disc and retinal ganglion cells, resulting in impaired visual function. It is an incurable eye disease responsible for high rates of visual disability and is considered a "silent pandemic."

Projections estimate that by 2030 and 2040 the number of affected individuals will exceed 80 million and 111.8 million, respectively. According to the Pan American Health Organization, in nine countries of the Americas region, blindness is more frequent in rural and marginalized populations, demonstrating the influence of social determinants on the evolution and prognosis of the disease. (5)

There is a group of “circumstances in which people are born, grow up, work, live and age, including the broader set of forces and systems that influence the conditions of daily life”, (6) with repercussions on individual and collective health, defined by the WHO as social determinants of health (SDH).

In Cuba, the prevalence of blindness has been estimated at 1:200 inhabitants, and glaucoma is recognized as the second leading cause of blindness, but the leading cause of irreversible blindness. (7) The research was developed with the objective of establishing the association between SSDs and blindness due to glaucoma.

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Methods

An analytical, case-control study was conducted in 2024 in the eastern Cuban municipality of Las Tunas. The study population consisted of 3,037 individuals with glaucoma in Las Tunas, receiving ophthalmological care in the local health areas. The sample, obtained through probabilistic cluster sampling with three clusters (corresponding to the Aquiles Espinosa, Dr. Gustavo Aldereguía, and Arcos Luque health areas), with a 95% confidence level and a 5% margin of error, comprised 342 individuals who met the inclusion and exclusion criteria. Two groups were formed: a study group of 114 patients with blindness due to glaucoma and a control group of 228 patients with glaucoma without blindness, in a 2:1 ratio.

Inclusion criteria: adults over 40 years of age, residents in the studied health area, diagnosed with primary open-angle and closed-angle glaucoma, who gave their informed consent.

Exclusion criteria: people with neuropsychiatric disorders whose condition did not allow obtaining the information necessary for the research.

The information was obtained through interviews and medical history; a designed survey was applied, taking into consideration the DSS described in the literature. (8)

The variables studied were: biological factors (age, sex, ethnicity, family history of glaucoma, concomitant systemic diseases), lifestyles (visual care, working conditions, adherence to treatment, attendance at periodic ophthalmology check-ups, daily hours spent performing physical activity), economic situation (marital status, level of education, geographical location, transportation).

Among the concomitant systemic diseases considered were hypertension, diabetes mellitus, ischemic heart disease, and migraine.

Visual care was related to the use of adequate lighting for activities that require visual effort (reading, sewing, writing, watching television, working in front of screens), not

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exposing oneself to screens (cell phones, computers, tablets) for more than eight hours, frequently performing eye exercises, and always wearing sunglasses when exposed to ultraviolet rays. (8)

Working conditions that pose a visual risk for glaucoma were considered to be those activities that involve prolonged exposure to electronic device screens, inadequate lighting, postures and physical exertion that affect blood and eye pressure, and being subjected to stress and work fatigue. (9)

The SPSS statistical software, version 20 for Windows, was used for statistical analysis. Absolute and relative frequencies were analyzed, and the association between intermediate DSS scores and blindness due to glaucoma was established using the Chi-square test and Fisher's exact test, with a significance level of 95% when p≤0.05.

Ethical considerations: the research was carried out under the principles of the Declaration of Helsinki, with the endorsement of the Research Ethics Committee and Scientific Council of the executing institution, Dr. Ernesto Guevara de la Serna Provincial General Teaching Hospital.

Results

The study of biological factors as a social determinant of health (Table 1) showed that age over 50 years, family history of glaucoma and the presence of associated systemic disease such as HTA and DM influence the evolution towards blindness from glaucoma.

Table 1 Biological factors as a social determinant of health that influence blindness due to glaucoma.

DSS	Glaucoma with blindness		Glaucoma without blindness		X2 or F	P
	No.	%	No.	%		
Age						

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> 50 years		111	97.37	185	81.14	17,192934	0.000034
19-50 years		3	2.63	43	18.86		
Sex							
Male		60	52.63	132	57.89	0.855	0.355142
Female		54	47.37	96	42.10		
Ethnicity							
White		66	57.89	123	53.95	0.4789916	0.488880
Not white		48	42.11	105	46.05		
Family history of glaucoma							
Yeah		112	98.25	186	163.16	18,83191	0.000014
No		2	1.75	42	18.42		
Associated systemic disease							
HTA	Yeah	114	100	212	92.98	8,392638	0.003767
	No	0	0	16	7.02		
DM	Yeah	85	74.56	131	57.46	9.556547	0.001992
	No	29	25.44	97	42.54		
Ischemic heart disease	Yeah	46	40.35	83	36.40	0.50409436	0.477707
	No	68	59.65	145	63.60		
Migraine	Yeah	27	23.68	48	21.05	0.30741572	0.579270
	No	87	76.32	180	78.95		

The analysis of lifestyles as a social determinant of health (Table 2) showed that patients who do not perform the recommended visual care, those with a history of exposure to work conditions with visual risk, non-adherence to treatment and irregularity in periodic check-ups with ophthalmology have an impact on the appearance of blindness due to glaucoma.

Table 2. Lifestyles as a social determinant of health that influence blindness from glaucoma.

DSS	Glaucoma with blindness		Glaucoma without blindness		X2 or F	P
	No.	%	No.	%		
Eye care						
No	106	92.98	137	60.09	39,983166	0.00
Yeah	8	7.02	91	39.91		
Background on working conditions						
With visual risk	73	64.04	78	34.21	27,41597	0.00
No visual risk	41	35.96	150	65.79		
Adherence to treatment						
No	108	94.74	149	65.35	35,139347	0.00
Yeah	6	5.26	79	34.65		
Attendance at regular ophthalmology check-ups						
No	98	85.96	131	57.46	27,91958	0.00
Yeah	16	14.04	97	42.54		

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Daily hours spent on physical activity						
Does not engage in physical activity	72	63.16	162	71.05	2,1923077	0.138701
1 or more hours daily	42	36.84	66	28.95		

The examination of the economic situation as a social determinant of health (Table 3) revealed that patients with low levels of education and residents in rural areas are more likely to develop blindness from glaucoma.

Table 3 Economic situation as a social determinant of health that influences blindness from glaucoma.

DSS	Glaucoma with blindness		Glaucoma without blindness		X2 or F	P
	No.	%	No.	%		
Marital status						
Married or partnered	110	96.49	217	95.18	0.31376147	0.575381
Single, widowed, or divorced	4	3.51	11	4.82		
Level of education						
Low (Primary or secondary)	89	78.07	57	25	87,4899	0.00
High (Pre-university or university)	25	21.93	171	75		
Geographical location						
Urban	81	71.05	189	82.89	6.4125	0.011332
Rural	33	28.95	39	17.11		
Transport						
The family does not have its own means of transportation	97	85.09	184	80.70	0.99760807	0.317890
The family has its own means of transport	17	14.91	44	19:30		

Discussion

In Cuba, awareness campaigns have been developed to prevent blindness; however, a large percentage of the population is unaware of the basic actions needed to preserve visual health. This lack of knowledge delays seeking medical attention and, coupled with the absence of national screening programs for at-risk groups, such as people over 40 or with a family history of blindness, limits the prevention of blindness from glaucoma.

Advanced age is a determining factor in the prevalence of visual impairment. Studies identify older age as a risk factor for glaucoma, although this depends on race and ethnicity. For example, the prevalence of primary open-angle glaucoma (POAG) was found to be higher (12.2%) among Black patients aged 80, but the increased risk of developing glaucoma per decade of age was greater among Hispanics and lower among Asians, although this may be attributed to genetic factors. (5)

A national study conducted at the ophthalmological center of a health institution in Havana, in patients with glaucoma, found an average age of 61 years, with the most prevalent age ranges being those over 60 years old (54%) and the 41-60 year old group (32%), findings that coincide with other regional studies and with this research.[10]

Molinet et al., (10) described the presence of comorbidities in patients with glaucoma: type 2 diabetes mellitus in 22%, high blood pressure in 53% and family history in 40%.

Similar results to those reported above were found by Suárez et al. (7), who identified family history, migraine, cardiovascular disease, hypertension, and diabetes as systemic risk factors associated with primary open-angle glaucoma. It is recognized that lifestyle directly influences health and promotes the development of chronic diseases that increase intraocular pressure and are linked to blindness. (8) In contrast, adopting healthy habits (balanced diet, physical activity, regular eye exams, and adherence to treatment) helps reduce the risk.

The intensive use of digital screens in work and recreational environments has generated concern in the scientific community due to its potential effects on eye health. Arman et al. (9) conducted a multicenter study that linked this exposure to eye strain, dry eye, and variations in intraocular pressure. Such challenges require multifactorial approaches, including adaptations in the work environment and holistic care strategies. (11)

Visual diseases rank fifth as a cause of permanent work disability, accounting for 4% of cases. (12) Glaucoma, in particular, is associated with unemployment, absenteeism,

decreased productivity, and a significant economic impact. Furthermore, it affects individuals' physical, emotional, and professional performance. (11)

Educating the population is key to modifying lifestyles. However, transmitting information does not guarantee understanding or adequate perception. In this regard, research by Suárez et al. (13) demonstrated a statistically significant relationship between educational level and knowledge (p=0.000002), attitudes (p=0.000490), and practices (p=0.000229) regarding the prevention of blindness from glaucoma. This reflects that people with less education require personalized educational strategies based on their abilities and needs.

No less important are the economic factors that condition access to medical care. Although polyclinics offer primary health services, in rural communities many people lack transportation to reach them. Bourne et al. (14) pointed out that the greatest burden of avoidable blindness falls on rural and low-income populations, which constitutes a problem of distributive justice. These limitations explain the unequal distribution of blindness in rural areas. Even in developed countries, the differences are evident, but they are accentuated in contexts with more restricted economies. (8,15) Visual loss reduces opportunities to access better-paying jobs, generating a social and familial burden. (16)

The Global Burden of Disease Expert Group (14) warns that one of the main challenges today is preventing visual impairment in a progressively aging global population. Studies underline the need for robust information systems to design effective public health policies, programs, and community projects. (16)

Glaucoma impacts both general health processes and specific aspects, including mental health, by affecting cognitive, emotional, and behavioral dimensions related to comorbidities and the high rate of visual impairment associated with this disease. (16,17) Preventing blindness from glaucoma requires integrating social determinants into eye health policies, (17) and addressing the problem not only from a comprehensive medical perspective, but also as a challenge of social justice.

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Conclusions

The main social determinants of health that influence the occurrence of blindness from glaucoma are age over 50, family history, presence of high blood pressure and diabetes mellitus, failure to perform recommended visual care, history of exposure to work conditions with visual risk, non-adherence to treatment, irregularity in periodic ophthalmological check-ups, low level of education and residence in rural areas.It is essential to design social strategies-Health interventions that modify the environment of social determinants linked to the progression to blindness from glaucoma are needed. These strategies should include comprehensive care for associated diseases, as well as promoting healthier lifestyles that support visual protection and overall well-being.

Bibliographic references

1. Rodríguez G, Meras RM. Considerations on the concept of “health”: A Cuban proposal. Rev Medicent Electrón [Internet]. 2022 [cited 2026 Jan 15]; 26(1): 122-30. Available from:http://scielo.sld.cu/pdf/mdc/v26n1/1029-3043-mdc-26-01-122.pdf

2. De La Guardia MA, Ruvalcaba JC. Health and its determinants, health promotion and health education. JONNP [Internet]. 2020 [cited 2026 Jan 3]; 5(1): 81-90. Available from:https://scielo.isciii.es/pdf/jonnpr/v5n1/2529-850X-jonnpr-5-01-81.pdf

3. Economic Commission for Latin America and the Caribbean. The 2030 Agenda and the Sustainable Development Goals: an opportunity for Latin America and the Caribbean [Internet]. Santiago, Chile: ECLAC; 2023. [cited 4/02/2026]. Available

from:https://repositorio.cepal.org/server/api/core/bitstreams/cb30a4de-7d87-4e79-8e7a-ad5279038718/content

4. World Health Organization. Integrated, person-centered eye care, including preventable blindness and visual impairment. [Internet]. Geneva: WHO; 2020. [cited 2026 Feb 4]. Available from:https://apps.who.int/gb/ebwha/pdf_files/EB146/B146_R/-sp.pdf

5. Barría F, Jiménez J. Latin American guide to primary open-angle glaucoma [Internet]. Spain: International Council of Ophthalmology; 2019. [cited 2026/02/10]. Available from:https://paao.org/wp-content/uploads/2016/05/Guia-Glaucoma-2019-final-para-www.pdf

6. Pan American Health Organization. Social determinants of health [Internet]. Washington, DC: PAHO; 2025. [cited 4/02/2026]. Available from:https://www.paho.org/es/temas/determinantes-sociales-salud

7. Suárez N, Fernández L, Concepción MR, Hormigo IF, Vázquez KR. Systemic risk factors associated with primary open-angle glaucoma in the adult population. Cuban Journal of Military Medicine [Internet]. 2025 [cited 2026 Feb 4]; 54(3): e025076350. Available from:https://revmedmilitar.sld.cu/index.php/mil/article/view/76350/3038

8. Loza V, Alvarado S, Suárez S, Aguirre SE. Social determinants and eye health in adult residents of a community in Ica – 2022. Rev. enferm. Vanguard [Internet]. 2023 [cited 4/02/2026]; 11(1): 34-46. Available from:https://revistas.unica.edu.pe/index.php/vanguardia/article/download/528/811/1773

9. Arman A, Vahedi H, Jafarizadeh A, Moshfeghinia R, Talebnezhad M, Heydari M, et al. The effect of digital devices screen use on intraocular pressure: A systematic review and meta-analysis. Graefes Arch Clin Exp Ophthalmol [Internet]. 2025[cited 06/13/2026]; 263(10): 2857-66. Available in:https://link.springer.com/article/10.1007/s00417-025-06876-9

10. Molinet LM, Pérez AI, Sablón R, Morell Z, Castillo C. Epidemiological, social and clinical indicators of glaucoma at the Hospital "Enrique Cabrera" Arch Hosp Univ “Gen Calixto García” [Internet]. 2022 [cited 06/13/2023]; 10(1): 126-38. Available in:https://revcalixto.sld.cu/index.php/ahcg/article/view/e910/766

11. Inayat H, Abdul M, Leung B, Jiang J, Robertson S, Malvankar MS. Detrimental impact on work productivity in patients with glaucoma: a systematic review. JFO Open Ophthalmology [Internet]. 2024 [cited 03/15/2025]; 8: 100142. Available in:https://doi.org/10.1016/j.jfop.2024.100142

12. Menéndez JA, Castell A. Permanent work disabilities due to visual causes. Review of 321 cases. Arch Soc Esp Oftalmol [Internet]. 2024 [cited 2026 Feb 4]; 99: 373-82. Available from:https://doi.org/10.1016/j.oftal.2019.12.013

13. Suárez N, Fernández L, Concepción MR. Determination of knowledge, attitudes, and practices regarding blindness due to glaucoma in an eastern Cuban population. Sinergía Académica [Internet]. 2025 [cited 2026 Feb 4]; 8(3): 57-70. Available from:http://sinergiaacademica.com/index.php/sa/article/view/558/1171

14. Bourne R. Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the Global Burden of Disease Study. Lancet Glob Health [Internet]. 2021 [cited 02/04/2026]; 9:e130–43. Available in:https://www.thelancet.com/action/showPdf?pii=S2214-109X%2820%2930425-3

15. Jaimes IC, Vélez C, Jaramillo CP. Social determinants of visual health and disease in coffee growers in Caldas, Colombia. Cuban Journal of Public Health [Internet]. 2020 [cited 2025 Feb 21]; 46(1): e1387. Available from:http://scielo.sld.cu/pdf/rcsp/v46n1/1561-3127-rcsp-46-01-e1387.pdf

16. Casado Díaz A. Social determinants of blindness and visual impairment and prevention strategies: analysis and experience from the field of visual health. REDC [Internet]. 2024

ONLINE VERSION: ISSN 1028-4818

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[cited 4/02/2026]; 51(1): 123-31. Available from:https://revistas.ucm.es/index.php/REDC/article/view/92708/4564456569281

17. Williams AM, Sahel JA. Addressing Social Determinants of Vision Health. Ophthalmol Ther [Internet]. 2022 [cited 02/04/2026]; 11(4):1371-82. Available in:https://pmc.ncbi.nlm.nih.gov/articles/PMC9174922/pdf/40123_2022_Article_531.pdf

Conflict of interest

The authors declare no conflict of interest in conducting the study.

Authorship contribution

Noraidis Suárez Estévez: Conceptualization, Research, Supervision, Methodology, Formal Analysis, Data Curation, Writing - Original Draft and Editing, Visualization, Project Management.

Liamet Fernández Argones: Supervision, Data Curation, Writing - Review and Editing.

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