Scientific Research Publishing

Open Journal of Ophthalmology, 2025, 15(2), 74-83
https://www.scirp.org/journal/ojoph
ISSN Online: 2165-7416
ISSN Print: 2165-7408

Study of the Association between Neurological Disorders and Visual Function Impairments at the Ophthalmology Unit of Douala General Hospital, Cameroon

Nyouma Paulette Jasmine[1,2*], Gams Massi Daniel[1,2], Aboubakar Hassan[2], Mpile Sacha Arlette[2], Ndongo Jean Audrey[2], Nomo Arlette[3], Koki Godefroy[3], Mapoure Njankouo Yacouba[1,2]

[1]Ophthalmology Unit, Douala General Hospital, Douala, Cameroon
[2]Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon
[3]Faculty of Medicine and Biomedical Sciences, University of Yaoundé, Yaoundé, Cameroon
Email: *jasminenyouma@hotmail.com

How to cite this paper: Jasmine, N.P., Daniel, G.M., Hassan, A., Arlette, M.S., Audrey, N.J., Arlette, N., Godefroy, K. and Yacouba, M.N. (2025) Study of the Association between Neurological Disorders and Visual Function Impairments at the Ophthalmology Unit of Douala General Hospital, Cameroon. *Open Journal of Ophthalmology*, **15**, 74-83.
https://doi.org/10.4236/ojoph.2025.152011

Received: April 12, 2025
Accepted: May 26, 2025
Published: May 29, 2025

Abstract

Background: In Cameroon, little is known about the visual repercussions of neurological disorders, according to the available literature. Local data could improve screening, prevention, and treatment, particularly at Douala General Hospital (DGH). This study aimed to analyze this association within the ophthalmology unit of the DGH. **Methods:** We conducted a retrospective study at the ophthalmology department of Douala General Hospital over five years (2015-2020), including 77 patients. Sociodemographic data, medical history, ophthalmological causes of visual acuity decline, as well as neurological manifestations and aetiologias, were collected from patient records. Statistical analysis, performed using R software, employed binomial logistic regression to calculate odds ratios (OR), confidence intervals (CI), and p-values, identifying neurological disorders associated with visual impairments. **Results:** The mean age of the patients was 59.38 ± 18.15 years. The most represented age group was 70 - 91 years (36.4%). Females were predominant (male-to-female ratio: 0.87). A total of 44 (57.14%) patients presented with vision impairments. The main neurological aetiologias were ischemic stroke (58.4%), hemorrhagic stroke (19.5%), and epilepsy (11.7%). Neurological disorders associated with visual function abnormalities included hemorrhagic stroke (OR = 3.75; 95% CI: 1.96 - 14.61; p = 0.02), Devic's disease (OR = 3.20; 95% CI: 1.34 - 30.06; p = 0.001), and migraines (OR = 2.52; 95% CI: 1.3 - 17.55; p = 0.003). **Conclusion:** Neurological disorders such as hemorrhagic stroke, Devic's disease, and

migraines are associated with visual function impairment.

Keywords

Neurological Disorders, Visual Function Impairments, Stroke, Devic's Disease, Migraine, Association

1. Introduction

Visual function impairments, including mild to moderate visual impairment and blindness, affect image perception, binocular vision, color perception, and peripheral vision. Nearly 2.2 billion people worldwide are affected, half of whom could have been prevented [1]. In Africa, prevalence can reach up to 15% in certain regions [2] [3]. These impairments increase dependency, social and professional difficulties, and the risk of depression, anxiety, and social isolation [4] [5], in addition to increasing the likelihood of falls and accidents, which contribute to the economic burden on individuals and healthcare systems. Risk factors include age, diabetes, hypertension, and neurological disorders such as stroke, multiple sclerosis, and Parkinson's disease [6].

The association between neurological disorders and visual impairments is rooted in complex biological mechanisms. Strokes cause ischemic damage in cerebral visual pathways, leading to hemianopia or other visual alterations due to neuronal loss in visual areas [7] [8]. In multiple sclerosis, the autoimmune process results in demyelination of the optic nerve, causing optic neuritis, slowed nerve conduction, and degeneration of retinal ganglion cells [9]. At the molecular level, Parkinson's disease induces dopamine dysfunction in the retina, a neurotransmitter essential for visual processing, resulting in reduced contrast sensitivity and impaired color perception [10]-[12]. Glutamate imbalances are also observed in several neurological disorders, causing excitotoxicity that damages neurons in visual pathways [13]. Similarly, Alzheimer's disease, through the accumulation of amyloid plaques and neurofibrillary tangles in cortical and retinal regions, leads to retinal cell degeneration, impairing vision [14].

Limited facilities with modern equipment, expensive cost for the average citizen, limitation of insurance coverage, low awareness and prevention of neurological and ophthalmic disorders are challenges regarding ophthalmological and neurological care in many low-income African countries like Cameroon. While the association between neurological and visual impairments is well-documented elsewhere, data specific to Africa and Cameroon are limited. This lack of local data restricts the understanding and optimal management of these comorbidities within a context that includes the previously cited sociocultural and environmental factors. Douala General Hospital, a referral center for ophthalmology, provides an ideal setting to study this association, with the goal of optimizing screening and treatment strategies for this population. This study aimed to examine this relationship among patients at the ophthalmology unit of Douala General Hospital to

improve care delivery in an African background.

2. Material and Methods

2.1. Study Design

We conducted a retrospective study over five years (2015-2020) in the ophthalmology department of Douala General Hospital (DGH). Ethical clearance (clearance No. 2666 CEI-Udo/06/2021/T) was obtained from the University of Douala. The study adhered strictly to the fundamental principles of medical research ethics.

2.2. Study Population

2.2.1. Inclusion Criteria

All patients with a neurological disorder who consulted at the ophthalmology unit of DGH between 31 December 2015 and 31 December 2020 and with complete medical records were included.

2.2.2. Exclusion Criteria

Patients with incomplete medical records—defined as missing at least one section (sociodemographic data, medical history, or clinical data)—were excluded from the study.

Out of 2640 patients who attended outpatient consultations during the study period, 2436 records were reviewed, of which 109 met the criteria of neurological condition requiring an ophthalmological consultation. A total of 77 records, corresponding to 154 eyes, were included after excluding incomplete or irretrievable records.

2.2.3. Data Collection Procedure

Data collection involved consecutively selecting the medical records of patients who consulted in both the ophthalmology and neurology departments of DGH during the study period. Variables collected included sociodemographic data (age, sex), anamnesis and clinical information (cardiovascular risk factors, ocular and clinical signs), paraclinical data in ophthalmology and neurology (visual examinations and brain imaging), as well as ophthalmological and neurological diagnoses. **Figure 1** illustrates the patient selection process during our study.

2.2.4. Data Analysis

The data were entered and analysed using Epi info version 7.2 software. The statistical analysis was firstly descriptive, by calculating the parameters of central tendency and dispersion (mean and standard deviation) for the quantitative variables. Numbers and frequencies were calculated in the form of tables, pie charts and vertical bar charts. Chi-square tests were used to compare qualitative variables with quantitative variables. We performed a multivariate analysis using binary logistic regression to investigate the association between neurological conditions and visual function abnormalities. The significance threshold used was established by a P-value < 0.05.

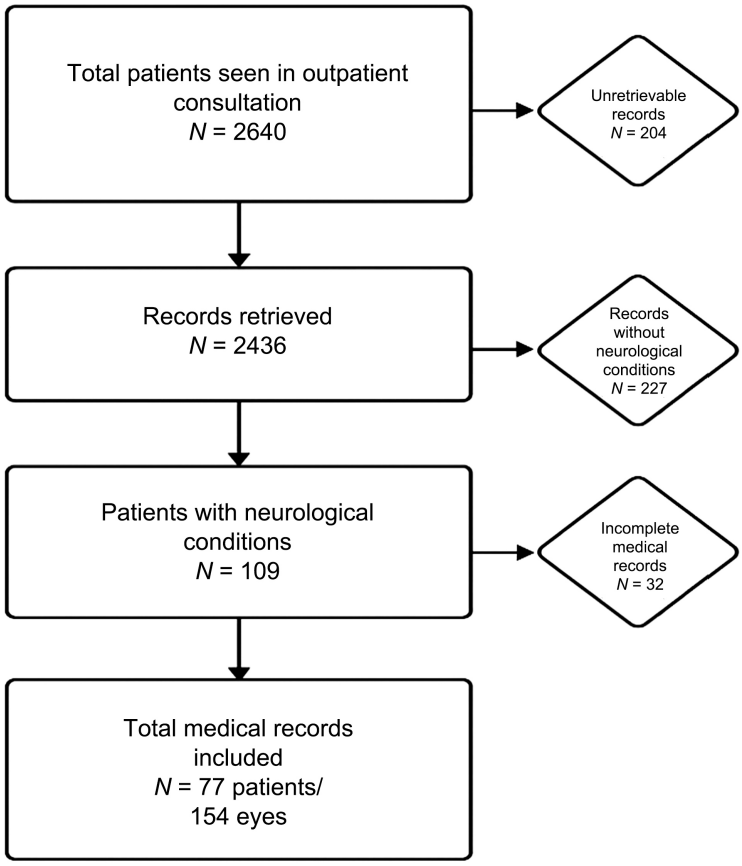

Figure 1. Flowchart diagram.

3. Results

3.1. Sociodemographic Factors and Medical History of the Study Population

Table 1 summarizes the sociodemographic characteristics and medical history of the study population, with a mean age of 59.38 years and a majority of participants aged 70 years and above (36.4%). The gender distribution is balanced, with a slight female predominance (53.2%). The medical history reveals a high prevalence of hypertension (68.8%) and diabetes (33.8%), followed by epilepsy (11.7%), dyslipidemia (10.4%), migraines (6.5%), and sleep apnea (3.9%). Additionally, 87.0% of participants use optical corrections, and 19.5% have undergone cataract surgery (Table 1).

3.2. Visual Function Abnormalities

Among the 77 patients studied, 57.1% had impaired visual acuity. Additionally, automated visual field testing was abnormal in 66.7% of the six examinations performed, while color vision impairment was observed in 100% of patients for the two tests conducted. These results highlight a high prevalence of visual abnormalities within this population, with potential implications for associated neurological conditions (Table 2).

Table 1. Sociodemographic factors and medical history of the study population.

Factors	Frequency	Percentage
Age Range (years)		
20 - 30	5	6.5
30 - 40	8	10.4
40 - 50	13	16.9
50 - 60	10	13
60 - 70	13	16.9
70+	28	36.4
Mean ± SD (years)	59.38 ± 18.2	
Sex		
Male	36	46.8
Female	41	53.2
Medical History		
Hypertension	53	68.8
Diabetes	26	33.8
Epilepsy	9	11.7
Dyslipidaemia	8	10.4
Migraine	5	6.5
Sleep Apnoea	3	3.9
Optical Corrections	67	87
Cataract Surgery	15	19.5

Table 2. Frequency of visual function anomalies.

Visual Function Anomalies	Frequency	Percentage
Pathological Visual Acuity		
Yes	44	57.1
No	33	42.9
Pathological Automated Visual Field		
Yes	4	66.7
No	2	33.3
Colour Vision Alteration		
Yes	2	100
No	0	0

3.3. Neurological Aetiologias of Visual Acuity Impairment

Ischemic stroke was the most common etiology, observed in 58.4% of patients, followed by hemorrhagic stroke (19.5%) and epilepsy (11.7%). Other notable conditions included Devic's disease (6.5%) and migraines (3.9%). This data highlights the predominance of vascular neurological conditions, such as strokes, suggesting a significant link with visual function abnormalities (Table 3). Table 4 shows a significant association between certain neurological conditions and visual function impairments. Patients with hemorrhagic stroke have an increased risk of visual impairments, with an OR of 3.75 ($p = 0.025$). Devic's disease and migraines also elevate this risk, with ORs of 3.2 ($p = 0.001$) and 2.52 ($p = 0.003$), respectively. These findings suggest that specific neurological conditions, particularly hemorrhagic stroke, Devic's disease, and migraines, are associated with an increased likelihood of visual dysfunction in patients (Table 4).

Table 3. Frequency of neurological conditions.

Neurological Condition	Frequency	Percentage
Ischaemic Stroke	45	58.4
Haemorrhagic Stroke	15	19.5
Epilepsy	9	11.7
Devic's Disease	5	6.5
Migraine	3	3.9

Table 4. Binary logistic regression showing the association between neurological conditions and visual function anomalies.

Neurological Condition	Frequency	OR	95% CI	p-value	Significant Association
Haemorrhagic Stroke	20	3.75	(1.96 - 14.61)	0.025	Yes
Ischaemic Stroke	45	0.85	(0.53 - 1.36)	0.373	No
Epilepsy	18	0.56	(0.22 - 1.42)	0.219	No
Devic's Disease	5	3.2	(1.34 - 30.06)	0.001	Yes
Migraine	10	2.52	(1.3 - 17.55)	0.003	Yes

4. Discussion

We observed a mean age of 59.38 years, with a strong representation of the 70 - 91 age group. This finding aligns with several international and African studies showing that neurological and visual disorders increase with age due to shared degenerative processes [15] [16]. Similarly, the female predominance observed in our sample, with a male-to-female ratio of 0.87, is supported by studies conducted in Africa [17] [18], which attribute this to women's longer life expectancy and the

higher prevalence of certain neurodegenerative diseases, such as Alzheimer's disease, in women [19]. Conversely, specific studies in Cameroon are scarce, but similar research conducted in Yaoundé also reported a high proportion of visual impairments among elderly individuals with neurological conditions [20]. The similarities between these studies and ours highlight the importance of understanding population-specific factors to adapt screening and management strategies within African contexts.

Our study revealed that 57.14% of patients with neurological conditions also experienced visual impairments. These findings are consistent with international and African research on the association between neurological dysfunctions and visual disorders. The World Health Organization [21] has reported a high prevalence of visual impairments among neurological patients, particularly in developing countries where access to specialized care is often limited. In a global meta-analysis, Kanski and Bowling [22] noted that visual disorders, such as optic neuropathies, are frequently associated with neurological diseases, including strokes and demyelinating conditions. In Africa, Adeoye and Bowman [17] in Nigeria observed a similar trend, attributing the high prevalence of visual impairments among neurological patients to challenges in accessing ophthalmological care. In Cameroon, Nguefack *et al.* [20] in Yaoundé confirmed these trends, with a high prevalence of visual impairments associated with neurological conditions, particularly among the elderly. Additionally, a study conducted in South Africa by Smith *et al.* [23] reported that nearly 60% of patients with neurological disorders also presented with visual impairments, highlighting the importance of early visual screening for these populations. These observations collectively underscore the need for a multidisciplinary approach in Africa to improve care for patients with neurological and visual comorbidities.

The results of our study also indicate that the primary neurological aetiologias associated with visual function impairments are ischemic stroke (58.4%), hemorrhagic stroke (19.5%), and epilepsy (11.7%). This corroborates the findings of Mapoure *et al.* [24], who identified strokes as the primary neurological pathology diagnosed in hospital settings in Douala. Significant associations were observed between visual impairments and hemorrhagic stroke (OR = 3.75), Devic's disease (OR = 3.20), and migraines (OR = 2.52). These results align with international research showing that strokes, particularly hemorrhagic strokes, frequently cause visual impairments due to damage to the visual pathways and cerebral regions involved in visual processing [25] [26]. Devic's disease, a severe demyelinating condition, is also known for its devastating effects on visual function, particularly through its direct impact on the optic nerve [27]. In the African context, Adeoye and Bowman in Nigeria reported a high incidence of visual impairments linked to migraines and neuroinflammatory conditions such as Devic's disease. In Cameroon, Nguefack *et al.* (2021) noted a high prevalence of visual impairments among patients with strokes and other neuroinflammatory conditions. By highlighting these associations, our study reinforces the importance of proactive diag-

nostic approaches to visual function impairments in cases of strokes and demyelinating diseases in Africa, where access to specialized care is limited.

Limitations

Our small sample size which is not representative of the entire local population of patients with neurological disorders associated with visual impairment. The difficulty of archiving medical records in our healthcare facility and the fact that not all our patients were able to undergo the necessary complementary examinations due to lack of financial means. Given these limitations, a multicentered and larger sample size study should be performed for better accuracy and precision in the spectrum of visual impairment associated with neurological disorders in Cameroon.

5. Conclusions and Recommendations

5.1. Conclusions

This study highlights a significant association between certain neurological disorders and visual function impairments among patients consulting at the ophthalmology unit of Douala General Hospital. More than half of the patients presented with visual impairments, with ischemic stroke, hemorrhagic stroke, and epilepsy being the most common neurological aetiologias. Hemorrhagic stroke, Devic's disease, and migraines were strongly associated with visual function abnormalities. These findings underscore the importance of strengthening screening and integrated management of neurological and ophthalmological conditions within hospital settings. Implementing multidisciplinary approaches, including early detection and targeted interventions, could improve patient outcomes and enhance the overall quality of care in Cameroon.

5.2. Recommendations

We recommend that policymakers include paraclinical examinations in universal health coverage. They should also organise awareness and screening campaigns for neurological and ophthalmological disorders.

We strongly advise local hospital managers to computerise medical records to compensate for their deterioration and loss.

We encourage neurologists to request systematic ophthalmological consultations for patients suffering from neurological disorders.

Acknowledgements

To all the coauthors who contributed to this study.

To the ophthalmology and neurology unit staff of Douala General Hospital.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Pizzarello, L., Abiose, A., Ffytche, T., *et al.* (2004) VISION 2020: The Right to Sight. *Archives of Ophthalmology*, **122**, 615-620. https://doi.org/10.1001/archopht.122.4.615

[2] Pascolini, D. and Mariotti, S.P. (2011) Global Estimates of Visual Impairment: 2010. *British Journal of Ophthalmology*, **96**, 614-618. https://doi.org/10.1136/bjophthalmol-2011-300539

[3] Rupert, R.A.B., Seth, R.F., Tasanee, B., Maria, V.C., Aditi, D., *et al.* (2017) Magnitude, Temporal Trends, and Projections of the Global Prevalence of Blindness and Distance and Near Vision Impairment: A Systematic Review and Meta-Analysis. *The Lancet Global Health*, **5**, e888-e897.

[4] Kocur, I. and Resnikoff, S. (2002) Visual Impairment and Blindness in Europe and Their Prevention. *British Journal of Ophthalmology*, **86**, 716-722. https://doi.org/10.1136/bjo.86.7.716

[5] Zhang, B., Xu, M., Wang, Q., Zhang, X., Liu, B., Li, M., *et al.* (2024) The Relationship between Illness Perception and Vision-Related Quality of Life among Chinese Patients with Diabetic Retinopathy: The Mediating Role of Resignation Coping Style. *BMC Ophthalmology*, **24**, Article No. 499. https://doi.org/10.1186/s12886-024-03762-6

[6] Cao, G., Chen, Z., Yao, S., Wang, K., Huang, Z., Su, H., *et al.* (2022) The Association between Vision Impairment and Cognitive Outcomes in Older Adults: A Systematic Review and Meta-Analysis. *Aging & Mental Health*, **27**, 350-356. https://doi.org/10.1080/13607863.2022.2077303

[7] Rowe, F.J. (2017) Vision in Stroke Cohort: Profile Overview of Visual Impairment. *Brain and Behavior*, **7**, e00771. https://doi.org/10.1002/brb3.771

[8] Mao, L., Yu, Z., Lin, L., Sharma, M., Song, H., Zhao, H. and Xu, X. (2024) Determinants of Visual Impairment among Chinese Middle-Aged and Older Adults: Risk Prediction Model Using Machine Learning Algorithms. *JMIR Aging*, **7**, e59810.

[9] Balcer, L.J., Miller, D.H., Reingold, S.C. and Cohen, J.A. (2014) Vision and Vision-Related Outcome Measures in Multiple Sclerosis. *Brain*, **138**, 11-27. https://doi.org/10.1093/brain/awu335

[10] Archibald, N.K., Clarke, M.P., Mosimann, U.P. and Burn, D.J. (2009) The Retina in Parkinson's Disease. *Brain*, **132**, 1128-1145. https://doi.org/10.1093/brain/awp068

[11] Bodis-Wollner, I. (2009) Retinopathy in Parkinson Disease. *Journal of Neural Transmission*, **116**, 1493-1501. https://doi.org/10.1007/s00702-009-0292-z

[12] Zhu, Z., Hu, W., Liao, H., Tan, Z., Chen, Y., Shi, D., *et al.* (2021) Association of Visual Impairment with Risk for Future Parkinson's Disease. *eClinical Medicine*, **42**, Article ID: 101189. https://doi.org/10.1016/j.eclinm.2021.101189

[13] Masters, B.R. (2014) The New Visual Neurosciences. Eds: John S. Werner and Leo M. Chalupa ISBN-13: 978-0-262-01916-3 the MIT Press. *Graefe's Archive for Clinical and Experimental Ophthalmology*, **252**, 1341-1343. https://doi.org/10.1007/s00417-014-2661-z

[14] Shi, H., Koronyo, Y., Rentsendorj, A., Fuchs, D., Sheyn, J., Black, K.L., *et al.* (2021) Retinal Vasculopathy in Alzheimer's Disease. *Frontiers in Neuroscience*, **15**, Article 731614. https://doi.org/10.3389/fnins.2021.731614

[15] World Health Organisation (2018) Classification of Diseases (ICD). Report of WHO Consultation. WHO. https://www.who.int/standards/classifications/classification-of-diseases

[16] Bouscaren, N., Kacem, M.A. and Mghirbi, S. (2019) Association between Aging and Visual Impairment in Neurological Diseases: A Study in Tunisia. *Neuroophthalmology*, **43**, 16-24.

[17] Adeoye, A. and Bowman, F. (2018) Prevalence of Neurological Disorders in African Populations: A Systematic Review. *African Journal of Neurology*, **12**, 45-59.

[18] Ayedun, C.A., Olatunji, A.O. and Sulaimon, T.A. (2020) Gender Differences in Neurological and Visual Health among Elderly Populations in Sub-Saharan Africa. *Journal of Aging and Health*, **32**, 821-834.

[19] Petersen, R.C., Lopez, O. and Armstrong, M. (2016) Prevalence of Alzheimer's Disease and Other Dementias in Women: A Review. *Journal of Neurology*, **263**, 1032-1040.

[20] Nguefack, M.S., Kengne, A.P. and Bessala, M. (2021) Visual Disorders in Elderly Patients with Neurological Diseases in Cameroon: A Hospital-Based Study. *Journal of Ophthalmic Research*, **29**, 235-241.

[21] World Health Organization (2017) Global Strategy and Action Plan on Ageing and Health. World Health Organization. https://www.who.int/publications/i/item/9789241513500

[22] Salmon, J.F. (2019) Kanski's Clinical Ophthalmology. 9th Edition, Elsevier, Amsterdam.

[23] Smith, J.A., Modisane, S. and Molefe, P. (2020) Vision Impairment among Patients with Neurological Disorders in South Africa. *African Journal of Ophthalmology*, **38**, 152-160.

[24] Mapoure, N.Y., Doumbe, J.I., Massi, D.G., Nynyikua, N.T., Kuate, T.C. and Luma, N.H. (2018) Epidémiologie clinique des affections neurologiques dans la ville de Douala. *Revue de Médecine et de Pharmacie*, **8**, 738-750.

[25] Pula, J.H. and Yuen, C.A. (2017) Eyes and Stroke: The Visual Aspects of Cerebrovascular Disease. *Stroke and Vascular Neurology*, **2**, 210-220. https://doi.org/10.1136/svn-2017-000079

[26] Rowe, F.J., Hepworth, L.R., Howard, C., Hanna, K.L. and Currie, J. (2020) Impact of Visual Impairment Following Stroke (IVIS Study): A Prospective Clinical Profile of Central and Peripheral Visual Deficits, Eye Movement Abnormalities and Visual Perceptual Deficits. *Disability and Rehabilitation*, **44**, 3139-3153. https://doi.org/10.1080/09638288.2020.1859631

[27] Jarius, S., Aktas, O., Ayzenberg, I., Bellmann-Strobl, J., Berthele, A., Giglhuber, K., *et al.* (2023) Update on the Diagnosis and Treatment of Neuromyelits Optica Spectrum Disorders (NMOSD)—Revised Recommendations of the Neuromyelitis Optica Study Group (NEMOS). Part I: Diagnosis and Differential Diagnosis. *Journal of Neurology*, **270**, 3341-3368. https://doi.org/10.1007/s00415-023-11634-0