

# Ocular Complications in Diabetic Patients: Prevalence, Impact on Quality of Life, and Implications for Healthcare

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## Abstract

**Introduction:** Diabetes, a chronic disease characterized by persistent hyperglycemia, poses a major global health challenge. In Gabon, 10% of the population is affected by this condition, highlighting the need to actively understand and manage it. Ocular complications of diabetes, including diabetic retinopathy, glaucoma, and cataracts, have a devastating impact on patients quality of life and represent a crucial issue for healthcare systems. **Methodology:** This study conducted in Libreville from February 9, 2022, to April 15, 2022, was cross-sectional, longitudinal, and descriptive, with prospective data collection. Participants were diabetic patients regularly followed in the endocrinology department of CHUL, who were referred for a comprehensive ophthalmological examination at CHUO. Sampling was exhaustive, with strict inclusion criteria aimed at ensuring the representativeness of the study population. **Results:** The mean age of participants was  $57.5 \pm 13.2$  years with a male-to-female ratio of 0.8. Personal histories were dominated by hypertension, while family histories were dominated by diabetes. Ocular complications of diabetes included refractive disorders (78.9%), cataracts (31.7%), glaucoma (78.9%), and diabetic retinopathy (13.7%). These ocular complications had a significant impact on participants' quality of life, leading to impaired vision (78.9%), difficulties in

carrying out daily activities (62.2%), the need for caregiver assistance (50.3%), high levels of stress and anxiety (68.9%), regular medication intake (71.4%), adherence to a specific diet (55.9%), and frequent blood glucose monitoring (74.5%). **Conclusion:** This study highlights the major impact of diabetic ocular complications on patients' quality of life.

## Keywords

Ocular Complications, Diabetes, Quality of Life, Prevalence, Gabon

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## 1. Introduction

Diabetes constitutes a growing global health issue, affecting over 463 million people according to the World Health Organization (WHO) [1] [2]. This chronic disease, characterized by persistent hyperglycemia, leads to severe complications affecting various bodily systems, including nerves and blood vessels. Contrary to some perceptions, diabetes is not limited to developed countries but also poses a significant challenge in Africa, where its prevalence is substantial, with 19 million recorded cases [3] [4]. In Gabon, the burden of diabetes is evident, with a prevalence of 9.8% since 2013, although more recent data is lacking [2] [5]. In addition to direct implications on physical health, diabetes is also associated with a wide range of ocular complications, including diabetic retinopathy, glaucoma, cataracts, and refractive disorders. These ocular complications have a devastating impact on the quality of life of diabetic patients, affecting their ability to perform daily tasks, maintain autonomy, and engage socially. Besides individual implications, diabetic ocular complications also have a significant economic impact, imposing high costs on healthcare systems and individuals themselves [6]-[13]. Specialized eye care and necessary treatments to manage these complications represent a significant financial burden, underscoring the importance of research in this field to reduce costs and improve intervention effectiveness. In this regard, this preliminary study aims to explore the increasing prevalence of ocular complications among diabetic patients in Gabon, their impact on quality of life, and crucial implications for healthcare systems. By better understanding these challenges, we can develop more effective prevention and management strategies, thus contributing to improving the health and well-being of individuals affected by diabetes.

## 2. Methodology

This study was conducted in Libreville, the political and administrative capital of Gabon, over a period from February 9, 2022, to April 15, 2022. Adopting a cross-sectional, longitudinal, and descriptive approach, it prioritized prospective data collection to ensure reliability. Research sites included the Libreville University Hospital Center (CHUL) for endocrinology outpatient consultations,

as well as the Owendo University Hospital Center (CHUO) for ophthalmological consultations and examinations.

The choice of these sites was rigorously considered due to the presence of specialized units required for the study. CHUL had a diabetology unit, while CHUO had an ophthalmological consultation unit. This selection ensured the availability of resources and competent specialists for each stage of the research.

The study population consisted of diabetic patients regularly followed at CHUL and who consulted the endocrinology outpatient department during the study period.

Inclusion criteria required a clearly established diagnosis of diabetes and consent to undergo a comprehensive ophthalmological examination at CHUO to detect possible ocular complications. Some patients were excluded from the study, including those with unclear diabetic status (impaired glucose tolerance, moderate fasting hyperglycemia), those who refused to participate, and those with pre-existing ocular pathologies making it impossible to perform fundus examination to search for ophthalmological complications.

Sampling was exhaustive, including all patients encountered during the study period who met the inclusion criteria. Participants, voluntarily and consecutively selected by a team comprising an ophthalmologist and the principal investigator, were recruited in the endocrinology department of CHUL after being informed about the study. Each participant received detailed information sheet and an informed consent form before participating in the study.

Participants who gave consent were then subjected to a comprehensive ophthalmological examination at CHUO, including visual acuity measurement, refraction, intraocular pressure measurement, slit-lamp examination, fundus examination, and evaluation of their impact on quality of life. Patients with ocular complications received regular medical follow-up.

All collected data were recorded on a collection sheet, using a standardized survey form to ensure consistency and accuracy of the collected information. The data were then entered into a Microsoft Office® Excel file and processed and analyzed using XLSTAT 2022 software. Statistical analyses allowed calculation of proportions, means, and standard deviations, with appropriate tests such as Chi-square test for comparison of proportions, and Wilcoxon and Mann-Whitney tests to examine relationships between quantitative and qualitative variables. The significance level was set at 5% ( $p = 0.05$ ).

Before the study began participants were informed about the survey process and the nature of the ophthalmological examination, ensuring their confidence and voluntary informed consent. All study steps were conducted in accordance with ethical principles, with assurance of data confidentiality and obtaining voluntary informed consent from each participant. Necessary authorizations were obtained from the CHUL and CHUO authorities, following the recommendations of the Helsinki Declaration on the ethical use of living beings.

### 3. Results

The results of this study provide a thorough analysis of the cohort of 161 examined diabetic patients, highlighting their demographic profile and the crucial impact of the disease on their quality of life (Figure 1). The mean age of participants was  $57.5 \pm 13.2$  years with extremes ranging from 10 to 86 years, and a higher distribution of females (55.3%), resulting in a male-to-female ratio of 0.8. The majority of the population had a secondary education level (46.6%) and the majority were unemployed (52.2%). Participants mainly resided in Libreville (72.7%). The medical history revealed a high prevalence of hypertension (68.3%) and family history of diabetes (71.4%) (Table 1). Type 2 diabetes was present in 89% of participants with an average duration of  $14.0 \pm 8.7$  years. Ocular complications were dominated by refractive disorders (78.9%) with a predominance of hyperopia (68.9%), myopia (19.3%), and mixed astigmatism (11.8%) (Table 2). Cataracts (31.7%), glaucoma (8.1%), and diabetic retinopathy (13.7%) were also observed (Table 3). These complications were common, affecting patients' daily lives (Table 4) and resulting in impaired vision (78.9%), difficulties in daily activities (62.2%), additional assistance needs (50.3%), a high level of stress related to managing the disease (68.9%), regular medication intake (71.4%), strict adherence to the diet (55.9%), and constant blood glucose monitoring (74.5%). These results underscore the importance of comprehensive diabetes management to improve patients' quality of life.

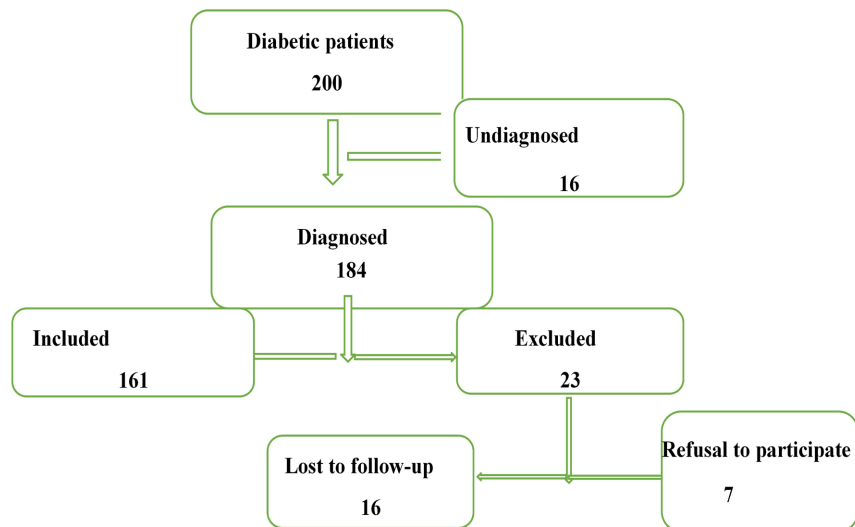


Figure 1. Flowchart describing participant selection.

Table 1. Distribution of participants according to medical history repartition.

Variables	Frequencies (N)	Percentages (%)
<b>Personal history</b>		
Hypertension		
No	51	31.7
<b>Yes</b>	<b>110</b>	<b>68.3</b>

## Continued

Alcohol		
<i>No</i>	79	49.1
<b><i>Yes</i></b>	<b>82</b>	<b>50.9</b>
Tobacco		
<i>No</i>	148	91.9
<b><i>Yes</i></b>	<b>13</b>	<b>8.1</b>
Cataract		
<i>No</i>	156	96.9
<b><i>Yes</i></b>	<b>5</b>	<b>3.1</b>
Corticosteroid therapy		
<i>No</i>	156	96.9
<b><i>Yes</i></b>	<b>5</b>	<b>3.1</b>
<b>Family history</b>		
Diabetes		
<i>No</i>	46	28.6
<b><i>Yes</i></b>	<b>115</b>	<b>71.4</b>
Hypertension		
<i>No</i>	35	21.8
<b><i>Yes</i></b>	<b>126</b>	<b>78.2</b>
Cataract		
<i>No</i>	144	89.4
<b><i>Yes</i></b>	<b>17</b>	<b>10.6</b>
Glaucoma		
<i>No</i>	147	91.3
<b><i>Yes</i></b>	<b>14</b>	<b>8.7</b>

**Table 2.** Distribution of participants according to refractive disorders.

Variables	Frequencies (N)	Percentages (%)
Hyperopia	111	68.9
Myopia	31	19.3
Mixed Astigmatism	19	11.8

**Table 3.** Distribution of complications or areas according to prevalence.

Ocular complications related diabetes	Prevalence (%)
Refractive disorders	78.9
Cataract	31.7
Diabetic retinopathy	13.7
Glaucoma	8.1

**Table 4.** Impact of diabetic ocular complications on the quality of life.

Variables	Frequencies (N)	Percentage (%)
Impaired vision		
<i>No</i>	34	21.1
<b><i>Yes</i></b>	<b>127</b>	<b>78.9</b>
Difficulties in daily activities		
<i>No</i>	61	37.8
<b><i>Yes</i></b>	<b>100</b>	<b>62.2</b>

**Continued**

Need for additional assistance			
	<i>No</i>	80	49.7
	<b><i>Yes</i></b>	<b>81</b>	<b>50.3</b>
Constant blood glucose monitoring			
	<i>No</i>	41	25.5
	<b><i>Yes</i></b>	<b>120</b>	<b>74.5</b>
Strict adherence to the diet			
	<i>No</i>	71	44.1
	<b><i>Yes</i></b>	<b>90</b>	<b>55.9</b>
Regular medication intake			
	<i>No</i>	46	28.6
	<b><i>Yes</i></b>	<b>115</b>	<b>71.4</b>
High level of stress related to diabetes management			
	<i>No</i>	50	31.1
	<b><i>Yes</i></b>	<b>111</b>	<b>68.9</b>

**4. Discussion**

This study highlights the obstacles faced by this research, including the short timeframe for patient recruitment and the refusal of some diabetic patients to participate, resulting in a limited sample size. These challenges made it difficult to generalize the results to the entire national population. Additionally, potential biases, such as patients being transferred to another medical service and restricted participant selection due to time constraints, were identified. It is evident that further larger-scale research is needed to better understand these issues and improve management strategies. Despite these limitations, it is crucial to recognize that ocular complications in diabetic patients in Libreville remain a major concern, thus emphasizing the continued importance of research and intervention in this field.

In Gabon, the high rate of diabetes poses a major challenge to public health, affecting nearly 9.8% of the population according to 2013 data [2] [5]. This reality underscores the urgent need to implement effective prevention, early detection, and management measures for this chronic disease. Additionally, ocular complications such as diabetic retinopathy, glaucoma, and cataracts pose a crucial health issue, potentially leading to significant vision loss if not promptly and effectively treated.

Comparing the prevalence of refractive disorders in our study (78.9%) to that of Majdi *et al.* (81%), significant similarities emerge [7]. The rates of hyperopia (68.9%), myopia (18.9%), and mixed astigmatism (12.2%) correspond to those reported by Tai *et al.*, with a similar prevalence of hyperopia (33%) and myopia (77%) [14]. These refractive disorders associated with diabetes may result from changes in the refractive index of the lens induced by the disease, leading to hypermetropia and myopization of the eyes of diabetic patients [15] [16]. Our study revealed that a significant percentage of participants, 31.7%, had cataracts, a rate lower than that reported by other studies conducted by Kim *et al.* (50%),

Xu *et al.* (53.1%), and Gninkpingo *et al.* (66.7%) [9] [17] [18]. This disparity underscores the crucial importance of close ophthalmological monitoring in diabetic patients. However, opinions differ regarding the risk factors associated with diabetes in the development of cataracts. Some researchers consider diabetes as an independent risk factor [2] [10], while others suggest it is more related to the duration of the disease [9].

In our study, the prevalence of glaucoma was 8.1% among patients with type 2 diabetes. This observation raises crucial questions about the correlation between these two medical conditions. Since glaucoma is a serious eye disease that can lead to irreversible vision loss, its association with type 2 diabetes raises particular concern. However, the exact nature of this correlation requires an in-depth approach to fully understand this complex relationship. The study conducted by Ellang *et al.* [19] makes a significant contribution to this discussion, which may shed light on the underlying mechanisms linking type 2 diabetes and glaucoma, with important implications for the clinical management of these patients. Interdisciplinary collaboration between ophthalmologists, endocrinologists, and researchers in basic sciences is essential to deepen our understanding of this association and to develop effective prevention and treatment strategies.

Our study revealed a prevalence of diabetic retinopathy of 13.7%. This figure is consistent with the research of Bediang *et al.* [20], who also observed a similar frequency of 12.3%. However, the results of Okamoto *et al.* [21] differ significantly, with a reported prevalence of 40%. This significant variation can be attributed to several factors, including the demographic composition of our study populations. It is important to note that our study included a higher proportion of patients with type 2 diabetes compared to other studies. Since diabetic retinopathy is known to be more common in type 2 diabetic patients, it is logical that our prevalence is higher. This observation underscores the crucial impact of demographic composition on the incidence and prevalence of diabetes complications, such as diabetic retinopathy. These results highlight the need to consider the demographic characteristics of the study populations when evaluating the prevalence of diabetes complications. A better understanding of these factors can help guide preventive and therapeutic interventions to reduce the prevalence of diabetic retinopathy and improve clinical outcomes in diabetic patients.

This study highlights the devastating impact of diabetic ocular complications on the quality of life of patients. Decreased or loss of vision due to these complications can lead to reduced economic productivity and thus become a financial burden for families and society. To address this issue, it is imperative to strengthen diabetes prevention programs, improve access to healthcare and ophthalmological treatments, and raise awareness among the population about the risk factors and symptoms of the disease.

Education and awareness are essential pillars in the fight against diabetes in Gabon. By informing and educating the population about the risks associated with diabetes and preventive measures, it is possible to reduce the incidence of

this disease and improve the quality of life of affected individuals.

Promoting a healthy lifestyle is a crucial aspect of diabetes education. By encouraging a balanced diet rich in fruits, vegetables, and whole grains, as well as regular physical activity, it is possible to prevent the development of type 2 diabetes and reduce complications in diabetic individuals. Additionally, education on weight management, stress, and sleep can help maintain overall health balance. Glycemic management is another important aspect of diabetes education. By teaching diabetic individuals the importance of regularly monitoring their blood glucose levels, taking their medication correctly, and following an appropriate meal plan, it is possible to prevent complications related to hyperglycemia and maintain good disease control.

In addition to awareness, early screening for diabetes is a fundamental pillar for effective disease management. Regular screening programs, organized in health centers and local communities, can help identify at-risk individuals and direct them to appropriate healthcare services for early diagnosis and treatment. Diabetes screening tests, such as fasting blood glucose measurement and glycosylated hemoglobin, are simple, inexpensive, and can be performed in primary healthcare settings.

Once diagnosed with diabetes, a multidisciplinary approach is indispensable to optimize clinical outcomes and prevent long-term complications. Diabetic patients should receive comprehensive healthcare, including regular follow-up by a general practitioner or endocrinologist, as well as ophthalmology consultations to detect and treat ocular complications.

Regular monitoring of ocular health is also crucial for diabetic individuals, as they are at increased risk of developing ocular complications such as diabetic retinopathy, glaucoma, and cataracts. By raising awareness among diabetic patients about the importance of regular ophthalmological examinations and encouraging them to adopt preventive measures to protect their vision, it is possible to reduce the risk of vision loss and improve quality of life.

Access to healthcare is of paramount importance in the management of diabetes and its ocular complications. Ensuring the accessibility of healthcare services to all, including the most vulnerable and marginalized populations, is essential. This may require investments in healthcare infrastructure, training of medical personnel, and implementation of community health programs to ensure universal and equitable healthcare coverage for the entire gabonese population.

### **Conflicts of Interest**

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

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