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Research Article

Ophthalmological Manifestations of Diabetes Mellitus: About 426 Cases in Lubumbashi (Democratic Republic of Congo)

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Abstract

Objective: To contribute to the improvement of ophthalmological care for diabetic patients.

Method: This cross-sectional descriptive study with prospective data collection concerned diabetic patients receiving consultations in the ophthalmology department of the university clinics of Lubumbashi during the period from November 2021 to February 2023. Non-probability sampling was used, taking into account patients seen during the study period. An ophthalmological assessment including visual acuity, colour test, examination of ocular surfaces and anterior segment, posterior segment and annex, Schirmer test and intraocular pressure was performed on all patients. The usual statistical tests were used to interpret the results.

Results: We examined 852 eyes of 426 diabetic patients. The sex ratio was 1. The average age of the patients was 58 ± 10.8 years. The average duration of diabetes was 8 ± 6.8 years. Mean blood glucose was 185 ± 79 mg/dl. Hypertensive diabetic patients were 38.8%. Diabetes type 1 represented 4.9% and type 2 was present in 95.1% of patients. The main ocular manifestations found were: cataract 33.6%; diabetic retinopathy 24%; dry eyes 15.8%; diabetic maculopathy 10.6%; glaucoma 9.5%; ametropia 9.1. Regarding the impact of diabetes on the eyes, 28.6% of patients were informed about it

Conclusion: The results of this study demonstrate the value of raising awareness among ophthalmologists about the complete examination of the eyes of diabetic patients because extraretinal manifestations are numerous and precede diabetic retinopathy.

Keywords: *Diabetes Mellitus; Visual Impairment; Blindness; Visual Disorders*

Introduction

Diabetes is the most common cause of blindness in adults of working age. People with diabetes are 25 times more likely to lose their sight than those without the disease [1].

Data from the literature tells us that diabetes mellitus is a major cause of blindness in people of working age worldwide, and it should also be noted that the prevalence of diabetes is increasing in Africa, and more specifically in sub-Saharan Africa, where diabetes used to be rare.

Diabetic retinopathy (DR) can lead to blindness and impaired vision if left untreated. Few data are available in France on the incidence and prevalence of diabetes-related blindness and visual impairment. According to the WHO in 2002, DR is responsible for 4.8% of cases of visual impairment worldwide. In Western Europe, diabetes is the fifth most common cause of blindness and visual impairment, after age-related macular degeneration (AMD), uncorrected refractive errors, glaucoma and non-operated cataracts [2].

It is estimated that 4.51 million of the diabetic population in sub-Saharan Africa have some form of diabetes-related eye condition. People with diabetes are around 25 times more likely to go blind than the normal population. The incidence of vision loss or blindness due to the ocular complications of diabetes raises sufficient public health issues, with diabetic retinopathy alone responsible for 12,000 to 24,000 new cases of blindness per year in the United States. Other known causes of blindness secondary to diabetes include cataracts, glaucoma, oculomotor paralysis and diabetic maculopathy [3].

In a study carried out in Kinshasa, Democratic Republic of Congo, 299 diabetic patients were examined, representing a frequency of 2% of all consultations in the department (n = 299/13401 patients). The incidence of blindness and visual impairment was 12% and 24% respectively. The leading cause of blindness among these diabetic patients was diabetic retinopathy (47%). Other causes were cataract 33%, glaucoma 17% and optic nerve atrophy 2.8% [4].

Visual problems linked to diabetes mellitus are fairly common and constitute a serious public health problem in Lubumbashi. An increasing number of diabetic patients are developing serious and disabling visual problems, which are all the more severe when glycaemic control is precarious. As a result, diabetes is a major cause of visual impairment in people over the age of forty. This is despite the growing number of medical staff and the multiplicity of medical training courses in the city of Lubumbashi. In a study carried out in Lubumbashi, the incidence of all forms of diabetic retinopathy was 13%, and diabetes-related blindness 0.27% [5].

Aim of the Study

The aim of this study is to help improve the ophthalmological management of diabetic patients by describing the ophthalmological lesions associated with diabetes mellitus and assessing diabetic patients' knowledge of the impact of diabetes on the eyes.

Materials and Methods

We conducted a descriptive cross-sectional study with prospective data collection from 1 November 2021 to 28 February 2023 at the Cliniques Universitaires de Lubumbashi, clinics located in the city centre of Lubumbashi, the second largest city in the Democratic Republic of Congo. Consenting type 1 and type 2 diabetic patients were included. We excluded patients with other forms of diabetes and those with a history of cranioencephalic trauma. This was a non-probability sample of at least 384 patients; calculated from Epi info version 7.2.3.1; and taking into account diabetic patients consulted during the period of our study. A survey form was drawn up and completed on the basis of patients' records, interviews and physical examinations. We described the variables relating to socio-demographic characteristics and medical history; an ophthalmological assessment including visual acuity, examination of the anterior segment and ocular surface, the posterior segment, colour vision, the Schirmer test and measurement of intraocular pressure were carried out on all patients. The data were collected on a pre-established data collection form, then recorded on an Excel spreadsheet and finally processed with Epi info version 7.2.3.1. We used the usual statistical tests, in particular the mean and standard deviation, to interpret the results, which are presented in the form of text and tables. The data were collected with respect for the human person and anonymity, respecting medical secrecy; without prejudice to those who did not agree to participate in the study. The medical ethics committee gave its approval number: UNILU/CEM/046/202.

Results

In this study, 852 eyes of 426 diabetic patients were examined. There were 214 male patients (428 eyes) and 212 female patients (424 eyes), with a sex ratio of 1. The mean age was 58 ± 10.8 years (with extremes of 12 and 82 years); the mean duration of diabetes was 8 ± 6.8 years (from 1 day to 22 years); the mean blood glucose level was 185 ± 79 mg/dl (with extremes of 61 mg/dl and 660 mg/dl); As regards the association with arterial hypertension, there were 144 hypertensive patients (33.8%) compared with 282 non-hypertensive patients (66.2%); as regards the type of diabetes, 21 patients were type 1 and 405 type 2, respectively 4.9% and 95.1%. Finally, mean visual acuity was 0.6 (with extremes of nihil and 1.0). It should be noted that 118 eyes had developed legal blindness, i.e. 13.8%, 547 eyes had developed visual impairment, i.e. 64.2%, and 187 eyes, i.e. 22%, had not developed visual impairment.

Lesions of the ocular surfaces and anterior segment

Lesions	Frequency	Cumulative frequency	%	Cumulative %
Purulent conjunctivitis	35	35	4.11	4.11
Subconjunctival haemorrhage	22	57	2.58	6.69
Neurotrophic keratitis	27	84	3.17	9.86
Superficial punctate keratitis	15	99	1.76	11.62
Glaucoma	81	180	9.50	21.12
Iritis rubeosis	13	193	1.53	22.65
Pigment epithelium atrophy	54	247	6.34	28.99
Cataract	287	534	33.68	62.68
Normal	318	852	37.32	100.00
Total	852	852	100.00	100.00

Table 1: *Frequency of ocular surface and anterior segment lesions (n= 852).*

In the anterior segment and ocular surfaces, 534 lesions were found, i.e. 62.68%. The most frequent lesion was cataract with a frequency of 33.6% followed by glaucoma with 9.5% as shown in table 1.

Lesions of the posterior segment

lesions	Frequency	Cumulative frequency	%	Cumulative %
Vitreous haemorrhage	20	20	2.35	2.35%
Diabetic retinopathy	204	224	23.95	26.30%
Retinal detachment	14	238	1.64	27.94%
Diabetic maculopathy	90	328	10.56	38.50%
Normal	524	852	61.50	100.00%
Total	852	852	100	100.00%

Table 2: *Frequency of posterior segment lesions (n = 852).*

328 Lesions were found in the posterior segment (38.50%) as shown in table 2. The most frequent lesion was diabetic retinopathy with a frequency of 23.95%, followed by diabetic maculopathy with 11%.

Lesions of the adnexa of the eyeball

Lesions	Frequency	Cumulative frequency	%	Cumulative %
Dry eyes	135	135	15.84	15.84%
Inflammatory lesions of the eyelids	23	158	2.70	18.54%
Oculomotor disorders	44	202	5.16	23.70%
Optic nerve atrophy	16	218	1.88	25.58%
No inflammatory lesions	634	852	74.42	100.00%
Total	852	852	100.00	100.00%

Table 3: *Frequency of lesions of the adnexa of the eyeball (n = 852).*

With regard to the adnexa of the eyeball, 218 lesions were observed, i.e. 25.58%. The most frequent lesion was ocular dryness with a frequency of 15.84%, followed by oculomotor disorders with 5.16% (See table 3).

Functional disorders

Lesions		Frequency	Cumulative frequency	%	Cumulative %
Ametropia	Myopia	74	74	8.68	8.68%
	Hypermetropia	4	78	0.47	9.15%
Dyschromatopsia	Tritanomaly	10	88	1.18	10.33%
	deuteranomaly	2	90	0.23	10.56%
Normal		762	852	89.44	100.00%
Total		852	852	100.00	100.00%

Table 4: *Functional disorders (n = 852).*

Functional disorders were marked by ametropia and dyschromatopsia. With regard to ametropia, we obtained a total of 78 eyes (9.15%), marked by myopia with 74 eyes (8.69%) and hyperopia with 4 eyes (0.47%). With regard to dyschromatopsia. We obtained 12 eyes (1.40%), of which tritanomalies represented 10 eyes (1.17%) and deuteranomalies 2 eyes (0.23%). As show the table 4.

Knowledge of the impact of diabetes on vision

Knowledge	Frequency	%	Cumulative %
No	464	54,46%	54,46%
Yes	388	45,54%	100,00%
Total	852	100,00%	100,00%

Table 5: *Knowledge of the impact of diabetes on vision (n = 852).*

Patients' knowledge of the impact of diabetes on the eyes was low; 54.46% did not know that diabetes can affect the eyes and lead to blindness (See table 5).

Discussion

There is no doubt about the relationship between the visual system and diabetes; several studies in Africa and around the world have demonstrated this. Diabetes, through its ocular manifestations and complications, is considered to be a major cause of visual impairment worldwide.

In our study, the mean age was 58 ± 10 years, and the mean duration of diabetes was 8 ± 6.8 years. The sex ratio was 1. Godwin., *et al*. found in their study a mean age of 57 years, a sex ratio of 0.3 in favour of females, and a duration of diabetes of 8 years [3]. The difference in the sex ratio may be explained by the fact that Godwin's study also included gestational diabetes.

The association of diabetes with arterial hypertension had a frequency of 33.8%; whereas Khalid., *et al*. found a frequency of 62.7% [6]. The difference from our study could be explained by the fact that the mean duration of diabetes in Khalid's study was 14 years in diabetic patients with cataracts.

In our study, we found a 33.6% incidence of cataract. Wisconsin Epidemiological Study; The 10-year cumulative incidence of cataract surgery was 8.3% in patients with type 1 diabetes and 24.9% in those with type 2 diabetes, giving a prevalence of 33.2% [7]. These results corroborate the findings of our study.

In our study, we found a frequency of 9.5% for glaucoma. Amesiane., *et al*. found 8.9% in Morocco [8]; these results corroborate our study. Joleen., *et al*. in South Africa found a frequency of 14.8% [9]. This difference may be linked to the high attendance at the national district hospital, where patients were transferred for in-depth care.

Diabetic retinopathy was present with a frequency of 24% in our study. In a survey carried out in Lubumbashi, Maloba., *et al.* found a prevalence of retinopathy of 12.7% [5]. This difference could be explained by the fact that prior to Maloba's work, there was little awareness among diabetic concerning systematic ophthalmological consultations. A pooled meta-analysis of individual participants from 35 studies conducted worldwide between 1980 and 2008 estimated the worldwide prevalence of any DR and ROP in diabetic patients at 35.4% and 7.5% respectively. Some of the frequencies mentioned in this meta-lysis are: Mathenge., *et al.* in Kenya found 35.5%, Sharew., *et al.* in Ethiopia found 41.4%, Lu., *et al.* in China found a prevalence of 23.0%, Dedov., *et al.* in Russia found a prevalence of 45.9%, Pugliese., *et al.* in Italy found a prevalence of 22.2%, Kempen., *et al.* in the USA found a prevalence of 40.3%, Nathoo., *et al.* Alberta in Canada found a prevalence of 27.2%, Esteves., *et al.* in Brazil found 44.4% [10]. We note that in almost all of the above studies, the frequency is high compared with our study, with the exception of the Lui study in China and the Pulgliese study in Italy, which corroborate our results; the difference compared with other studies can be explained by the fact that these are countries with a high frequency of diabetes and arterial hypertension, and also countries with a higher level of technical facilities for diagnosing diabetic retinopathy.

In our work, diabetic maculopathy represents a prevalence of 10.6%. These results are corroborated by Kahloun., *et al.* in Tunisia who found a prevalence of 8.7% [11] and Joanna., *et al.* found a prevalence of 10.2% in Australia [12].

Ocular dryness represented 15.8% of ocular disorders related to diabetes mellitus in our setting; Doghmene., *et al.* In Tunis, found a frequency of ocular dryness of 12.5% in diabetic patients [13]. This frequency is slightly lower than in our study, which could be explained by the small sample size (50 patients) and the average age of patients, which was 53 years, but with a predominance of women. In a study carried out in Abidjan, Boni., *et al.* found the frequency of dry eye to be 64.16% [14]. This high frequency may be explained by the fact that dry eye was diagnosed using the Schirmer test and the break-up time, whereas in our study we used only the Schirmer test.

With regard to oculomotor disorders, it should be noted that diabetes is the leading cause of neuropathy worldwide. Non-retinal diabetic complications, including oculomotor disorders, represent 1 to 3% of the ocular manifestations of diabetes. We found a frequency of 5% and the common oculomotor nerve was the most affected with 4.46% [14]. In our study, we considered the two branches of the common oculomotor nerve, the superior branch, which is responsible for ptosis, and the inferior branch, which is responsible for oculomotor disorders of the eyeball; this aspect means that our frequency is somewhat higher than that of other studies published in this field.

With regard to inflammatory lesions of the eyelids, we found a frequency of 2.7%, with the most frequent lesion being stye followed by blepharitis and finally chalazion. In a study carried out in Cameroon, Koki., *et al*. found the same sequence in terms of frequency, with stye first, followed by blepharitis and then chalazion [15]. This corroborates our results in terms of the importance of these lesions, despite the fact that this study was carried out in type 1 diabetics and the frequency of each lesion is not clearly noted.

As far as ametropia is concerned, we found a frequency of 9.1%. Mvitu in the Democratic Republic of Congo found 4% of ametropia to be the cause of reduced visual acuity in diabetics [16]. The results of Mvitu are very different from our study, perhaps because of the high number of type 1 diabetics. Cairncross., *et al.* found a 42.9% frequency of ametropia in South Africa [17]. This large difference could be explained by the fact that this hospital was a referral hospital where the majority of patients were referred and some were followed for a long time.

In our study we found that 54.4% of diabetics were unaware of the impact of diabetes on the eyes. Rajiv., *et al.* found a high level of knowledge of the ocular complications of diabetes, i.e. 72% [18]. This difference could be explained by the accessibility of care and the absence of indigenous practices. In their study in South Africa, Joleen., *et al*. found that 68.0% were aware of the impact of diabetes on vision and therefore the risk of blindness [9]. The difference in frequency compared with our study is thought to be linked to the standard of living of our populations and the accessibility of medical care. Godwin., *et al.* in South Africa reported that 49% were aware that diabetes affects vision [3]; this small difference could be explained by South Africa's high standard of living.

Conclusion

Diabetes is a major cause of visual impairment worldwide. Diabetes-related visual impairment causes visual disability in people of working age to support their families, sometimes resulting in a heavy socio-economic burden. Diabetes is a major challenge not only medically, but also socially and economically, especially in low-income countries with inefficient healthcare systems.

The results of this study provide ample evidence that the ocular manifestations of diabetes, apart from diabetic retinopathy, are frequent in our environment; with the increase in the prevalence of diabetes in sub-Saharan Africa, diabetes-related visual disorders will be even more numerous in the future, with the most unfortunate complication being blindness, which is difficult to reverse or even irreversible, especially in the context of our low-income countries where access to quality care poses enormous problems.

Conflicts of Interest

The authors declare no conflict of interest in relation to this work.

Authors' Contributions

Data collection was carried out by ourselves and assisted by Florent MPIA and Joseph KANKU. All authors contributed to this work and read and approved the final version of the manuscript.

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