Characterization of diabetic retinopathy in a screening program in Medellin, Colombia, in 2018

Caracterización de la retinopatía diabética en un programa de tamización en Medellín, Colombia, en el año 2018

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Abstract

Purpose: To identify the prevalence of diabetic retinopathy in diabetic patients of a screening program of the Hospital San Vicente Fundación in Medellín (Colombia), to describe the sociodemographic characteristics and the type of diabetic retinopathy and to evaluate the percentage of patients with vision-threatening diabetic retinopathy. **Method:** This is a cross-sectional descriptive study, in which diabetic patients of all ages and both genders were evaluated in the “No more blind from diabetes” campaign of the Hospital San Vicente Fundación in Medellín, conducted in the year 2018. **Results:** We evaluated 610 diabetic patients from the 2018 campaign. Most of the patients had type 2 diabetes, in total 528 (74.8%). Of the patients evaluated, retinopathy was found in 115 cases, for a prevalence of 18.8%. Proliferative retinopathy was found in 17 (14.7%) patients, and non-proliferative retinopathy was the most frequent in 98 patients (85.2%). The subgroup of vision-threatening diabetic retinopathy was made up of 48 (78%) patients, of which the diagnosis had not been made previously in 7 (14.5%) cases. **Conclusions:** The prevalence of diabetic retinopathy in the population studied is comparable with some of the studies carried out in some Latin American countries. This work provides relevant local epidemiological data about diabetic retinopathy and reinforces the importance of continuing screening campaigns to prevent cases of blindness with early diagnosis and treatment.

Key words: Diabetes. Diabetic retinopathy. Prevalence. Macular oedema. Screening. Classification.

Resumen

Objetivo: El propósito de este estudio es determinar la prevalencia de la retinopatía diabética en pacientes diabéticos de un programa de tamización del Hospital San Vicente Fundación de Medellín (Colombia), describir las características socio-demográficas y el tipo de retinopatía diabética, y evaluar el porcentaje de pacientes con retinopatía que amenaza la visión. **Método:** Estudio descriptivo, transversal, en el que se evaluó una base de datos de pacientes diabéticos de todas las edades y ambos sexos que acudieron a la campaña «No más ciegos por diabetes» del Hospital San Vicente Fundación de Medellín, realizada en el año 2018. **Resultados:** Se evaluaron 610 pacientes diabéticos de la campaña de 2018. La mayoría tenían diabetes tipo 2, en total 528 (74,8%). De los pacientes evaluados, en 115 se encontró retinopatía, para una prevalencia del 18,8%. El tipo proliferativo se encontró en 17 (14,7%) pacientes y el tipo no proliferativo fue el más frecuente, con

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98 pacientes (85,2%). El subgrupo de retinopatía que amenaza la visión estaba constituido por 48 (78%) pacientes, de los cuales en 7 (14,5%) no se había hecho el diagnóstico previamente. **Conclusión:** La prevalencia de la retinopatía diabética en la población estudiada es comparable a la encontrada en algunos de los estudios realizados en otros países de América Latina. Este trabajo aporta datos epidemiológicos locales relevantes sobre esta enfermedad y refuerza la importancia de continuar realizando campañas de tamización para prevenir los casos de ceguera gracias a un diagnóstico y un tratamiento tempranos.

Palabras clave: Diabetes. Retinopatía diabética. Prevalencia. Edema macular. Tamización. Clasificación.

Introduction

Diabetes is a complex chronic metabolic disease associated with elevated blood glucose levels that require ongoing medical care and several risk reduction strategies to prevent long-term macrovascular and microvascular complications. According to the World Health Organization (WHO), its prevalence is 8.5% in people over 18 years of age, and annually between 1.6 and 2 million people in the world die as a result of it. The prevalence of diabetes is increasing globally and current figures are expected to double by 2025¹.

Diabetic retinopathy (DR) is a progressive microvascular disorder that generates retinal ischemia, increased vascular permeability, retinal neovascularization, and macular edema². It has been reported that one in three (34.6%) diabetic patients has some type of DR³. All diabetic patients are at risk for DR and in developed countries this disease is the main cause of blindness in the working age population⁴. Likewise, as the prevalence of diabetes increases, the prevalence of DR also increases, including “vision-threatening DR”¹.

It is very important to categorize, classify and stage the severity of DR in order to establish an adequate treatment and explain the prognosis to the patient according to the severity of the disease. The international classification of DR includes five stages: 1) no apparent retinopathy; 2) mild non-proliferative DR (NPDR); 3) moderate NPDR; 4) severe NPDR; and 5) proliferative DR (PDR) characterized by neovascularization on the disc, retina, iris or anterior chamber angle, vitreous hemorrhage or tractional retinal detachment². Diabetic macular edema (DME) can be associated with any type of DR or occur alone².

There is a subclassification, called “vision-threatening DR”, which includes severe NPDR, PDR, and DME⁵. It has been found that 1 in 10 (10.2%) patients with DR are at visual risk and the trend grows with increasing prevalence of diabetes³.

Currently, only about 60% of diabetic patients have an annual screening for DR¹, which is why campaigns such as the one carried out in the Hospital San Vicente

Fundación de la Ciudad de Medellín are of vital importance to characterize the local population and detect DR cases, especially the group of patients with vision-threatening DR, so that early intervention can reduce cases of visual loss associated with the complications of this disease.

The purpose of this study was to characterize and evaluate the prevalence of DR in patients diagnosed with diabetes at the Hospital San Vicente Fundación de Medellín in the campaign “No more blind from diabetes” in 2018, to describe the sociodemographic characteristics and the type of DR in these patients according to the international classification for the severity of DR, and to estimate the percentage of patients in the vision-threatening DR group.

Methods

This is a cross-sectional descriptive study, in which diabetic patients of all ages and both genders were evaluated in the “No more blind from diabetes” campaign of the Hospital San Vicente Fundación in Medellín, conducted in November 2018.

In this campaign, diabetic patients from various regions of the department of Antioquia spontaneously go to the hospital once a year. Data on the history and current status of their disease are taken through a survey and a thorough ocular examination is also carried out with a dilated pupil, either with a slit lamp with a 90 diopter lens or with an indirect ophthalmoscope. All examinations are performed by ophthalmologists who record the findings, classifying patients as positive or negative for DR. If there is DR, then the patient is classified according to the international classification of DR and DME to define, according to the risk, the need of immediate treatment, deferred treatment or only monitoring.

Patients with incomplete information in the database were excluded. We did not estimate a sample size as it was a convenience sample that includes the total number of patients who meet the eligibility criteria.

We considered the following qualitative variables: sex, the neighborhood of residence, first or subsequent attendance to the campaign, knowledge about DR, type of diabetes, active smoking, history of arterial hypertension (AHT), history of dyslipidemia, knowledge about glycated hemoglobin (HbA1c), time since the last evaluation by an ophthalmologist, complications associated with diabetes, presence of DR, type of DR, presence of DME, concurrent diagnoses and need for urgent treatment in the following week depending on the response time of the insurer, with support of the social worker. The quantitative variables evaluated were age, time of evolution of diabetes in years, and last HbA1c value.

This study is classified as risk-free research according to resolution 8430 of 1993 of the Ministry of Health of Colombia. Approval was requested by the ethics committee from the research department of the Hospital San Vicente Fundación. As it is a cross-sectional study from secondary sources, it is not necessary to conduct an informed consent for the use of the information collected during the “No more blind from diabetes” annual campaign. Information and patient identification are kept confidential. The information will be used only for research purposes.

The information was exported, stored, and processed in the statistical program SPSS v21®. Tables, graphics and text were prepared using the Microsoft Office Word 365 word processor.

Quantitative variables are expressed as medians and interquartile ranges (IQR) due to non-normal distribution, and qualitative variables are reported as absolute numbers and percentages.

Results

Six hundred and ten records from a database of diabetic patients from the 2018 campaign were evaluated. Demographic characteristics are summarized in table 1.

A predominance of females was observed, with 390 patients (63.9%), and the median age of all patients was 60.5 years (IQR: 54-69). The majority (528, 74.8%) had type 2 diabetes. Only 43 (6.1%) patients were active smokers at the time of evaluation and 381 (62.4%) had hypertension.

For the variable “knowledge about the disease”, only 202 (33%) patients reported having some degree of knowledge about DR and 340 (56%) knew what HbA1c is. In addition, 304 (50%) attended the campaign again after having attended the previous year. The median

Table 1. Sociodemographic characteristics of the study population

Variable	n = 610	Percentage
Age in years, mean (IQR)	60.5 (54-69)	
Male	220	36
First time consultation	276	45
Known diabetic retinopathy	202	33
Time from diabetes diagnosis in years, mean (IQR)	12.5 (5-18)	
Patients with type 2 diabetes	528	74.8
Active smoking	44	6.2
Arterial hypertension	381	62.4
Dyslipidemia	380	62.2
Known HbA1c	340	56
Hba1c values, median (IQR)	7.7 (6.6-8.4)	
Complications associated with diabetes	139	22.7
Kidney damage	46	7.5
Time since last evaluation		
Less than 1 year	312	52
More than 1 year or never	298	48
Diabetic retinopathy	115	18
Proliferative	17	14.7
Non-proliferative	98	85.2
Mild	57	58.1
Moderate	33	33.6
Severe	8	8.1
Macular edema	32	5.2
Other diagnoses	141	23.1
Cataract	96	15.7
Glaucoma	17	2.7
Age-related macular degeneration	19	3.1
Other diagnoses	9	1.4
Requires urgent treatment	17	2.7

HbA1c: glycated hemoglobin; IQR: interquartile range.

HbA1c values was 7.7% (IQR: 6.6-8.4) in the entire sample, and in 139 (22.7%) patients some complication associated with diabetes was detected, with associated kidney damage in 46 (7.5%) patients. Only 312 (52%) patients had a fundus evaluation by an ophthalmologist

Table 2. Characteristics of the patients with diabetic retinopathy

	PDR n = 17 (14.7%)	NPDR n = 98 (85.2%)	p*
Time from diabetes diagnosis in years, mean (IQR)	22.1 (12-29.5)	15.5 (8-20.2)	0.027 [†]
HbA1c, median (IQR)	8.1 (6.8-8.9)	7.6 (6.9-8.9)	0.857 [†]
Kidney damage, n (%)	4 (23.5)	16 (16.3)	0.469 [‡]
Diabetic macular edema, n (%)	6 (35.2)	26 (26.5)	0.457 [‡]

HbA1c: glycated hemoglobin; NPDR: non-proliferative diabetic retinopathy; PDR: proliferative diabetic retinopathy.

*Statistical significance <0.05.

[†]Mann-Whitney U test.[‡]Chi-square.

or optometrist in the previous year. The most frequent concurrent diagnosis was cataract, in 96 (15.7%) patients.

Of the patients evaluated we found DR in 115, representing a prevalence of 18.8% (table 2). In 44 (38.2%) cases, the diagnosis of DR was *de novo*. There was a predominance in women, with 74 (64.3%) diagnosed with DR. The prevalence of DR was higher in patients with type 1 diabetes (24.3%) than in those with type 2 diabetes (17.9%). Eighty-two (71.3%) patients with DR also had hypertension. The type of DR according to the international classification is listed in table 1. We found PDR in 17 (14.7%) patients and NPDR in 98 patients (85.2%). From this group, mild NPDR was observed in 57 (58.1%) patients, moderate NPDR in 33 (33.6%), and severe NPDR in 8 (8.1%). The median time of evolution of diabetes in patients with and without DR was 16.2 years (IQR: 8-22.7) and 10 years (IQR: 4-16), respectively. A median HbA1c of 8.2% was found (IQR: 6.9-8.8) in the group of patients with DR, while in patients without DR it was 7.2% (IQR: 6.6-8.2). Of the 115 patients with DR, 32 (27.8%) had DME at the time of evaluation. Furthermore, 18 (15.6%) patients with DR had some degree of kidney damage. Table 2 shows the data of the patients with PDR and NPDR.

In the 32 cases (5.2%) with DME, the median time of evolution of diabetes was 11.5 years (IQR: 6.8-16.7). The median HbA1c in patients with DME was 8.8% (IQR: 7.2-11.8).

The subgroup of vision-threatening DR (severe NPDR, PDR and DME) was made up of 48 (7.8%) patients, and 7 (14.5%) patients had not been previously diagnosed. In this subgroup, only 10 (20.8%) patients had received some type of treatment, either with retinal laser photocoagulation or intravitreal injections of anti-angiogenics. They had a median HbA1c of 8.6% (IQR: 6.8-9). In this subgroup with a high risk of vision loss, 10 (20.8%) patients had some degree of kidney

damage and 12 (25%) required referral to their insurers to initiate urgent management. All patients in this group had been previously evaluated at some point by an ophthalmologist.

Overall, 17 (2.7%) patients required urgent referral and we requested complementary examinations in 41 (6.7%), that would be later evaluated by the ophthalmologists of their insurance companies.

Discussion

DR is a microangiopathic complication of diabetes, in which an increase in blood glucose leads to a shift in glucose metabolism to the sorbitol pathway and an increase in advanced glycation products and their derivatives in endothelial cells and pericytes, which ultimately leads to an alteration of the blood-retinal barrier, with leakage of blood components and formation of microaneurysms and hemorrhages^{6,7}. These alterations generate ischemic complications that stimulate the release of growth factors such as vascular endothelial growth factor, as well as vascular proliferation, increased bleeding, and associated tractional retinal detachment^{7,8}.

Population studies carried out in developed countries show that the prevalence of DR is 34.6%, and that of PDR reaches up to 7%⁹. It is said that the number of people with DR in the world will increase from 126 million in 2011 to 191 million in 2030¹⁰.

In this study, the prevalence of DR in the evaluated population of diabetic patients was 18.8%, lower than that observed in population studies in developed countries⁹. However, prevalence rates fluctuate between 17% and 45%⁹, a range that includes the value observed in our study. When comparing with other epidemiological studies conducted in Latin America, we found varying prevalence values. In Chile, Abuaud, et al.¹¹ reported a prevalence of 24% in a population of

468 diabetic patients. In Mexico, Prado, et al.¹² reported a much higher prevalence of 71% in a population of 13,670 diabetic patients in a span of 30 years. Other studies showed a similar prevalence, such as the one carried out by Amador, et al.⁶ in Honduras, that reported a prevalence of DR of 19% in a population of 177 diabetic patients. In Colombia, DR cases have increased in recent years, going from a prevalence of 12.86 per 100,000 inhabitants in 2009 to 19.76 per 100,000 inhabitants in 2014¹⁰.

Regarding the type of diabetes, despite the larger numbers of patients with type 2 diabetes in our population, we found a higher prevalence of DR in patients with type 1 diabetes (24.3%), consistent with other studies¹². Also, we observed a higher percentage of women in patients with DR, consistent with the reports in most prevalence studies^{6,12,13}.

Among the factors described associated with DR include the evolution time, the values of HbA1c, hypertension and the association with diabetic nephropathy¹⁴. In this study, it was found that the median duration of diabetes and the HbA1c value were higher in patients with a diagnosis of DR, which is comparable to what has been described in different studies around the world^{8,15-17}. Sixty-two percent of all diabetic patients had hypertension, and specifically 71% of patients with DR. In Cuba, Yáñez, et al.¹⁶ found hypertension in 42% of the diabetic population, which is comparable to the WHO data that report hypertension in 55% of patients with type 2 diabetes¹⁴. Likewise, we found that 13% of patients with DR had kidney damage as a complication of the disease, compared to only 4.4% of diabetic patients without DR. These data are similar to those found in a study with 472 diabetic patients in Cuba,¹⁶ in which diabetic nephropathy was found in 3.7% of patients without DR and in 10% of patients with DR.

Since DME is the main cause of vision loss in diabetic patients¹⁷ it is important to diagnose it, taking advantage of the greater accessibility to diagnostic tests such as optical coherence tomography that facilitates early detection to initiate proper management and improve prognosis. In this study, DME was found in 5.2% of the diabetic population, which is in the expected range according to the reported global prevalence, which varies according to the region¹⁸: 1.8% in countries like Chile¹⁹, 3.8% in the United States of America¹⁵ and as high as 15% in Turkey¹⁷.

A non-linear relationship has been described between HbA1c values and DME¹⁵, and this is associated with a longer duration of diabetes. In the present study, we also found that in patients with DME, both the time

of evolution and HbA1c values were greater compared to patients without DME.

The world has seen an increase in the prevalence of vision-threatening DR as diabetic patients increase, and it has even been found that in up to 11.1% of these cases there was no previous diagnosis of DR,⁵ due to failures or scarcity of screening programs. In the present study, 14% of the patients with vision-threatening DR had no previous diagnosis of DR, consistent with the figures described. The prevalence of vision-threatening DR was 7.8%, a value comparable with the prevalence in different regions of the world, such as Sweden, where Gustafsson and Hellgren²⁰ found a prevalence of 6.8%. The incidence of vision-threatening DR, as described, is related to the time of evolution of diabetes, and according to a study carried out in Liverpool, it increases from 0.3% in the first year to 3.9% in the fifth year of screening²¹.

Considering that DR has the potential to be the leading cause of vision loss and blindness worldwide, and that 80% of blindness secondary to DR is preventable with early diagnosis and treatment, especially in patients with vision-threatening DR, it is evident the relevant effect that effective and controlled screening programs have on this dramatic public health problem, with the aim of having a better planning of the needs and costs associated with the treatment of these patients, and thus accurately estimate the magnitude of DR, DME and vision-threatening DR and its risk factors in the different Latin American regions.

Conclusions

The prevalence of DR in the population studied is comparable to that observed in some of the studies carried out in Latin America. HbA1c values and the time of evolution of diabetes are decisive in the appearance of DME and the loss of vision. Despite the limitations of this study, as it is cross-sectional, basing much of its information on surveys and the heterogeneity of patients, we consider that it provides local epidemiological data of interest and also reinforces the importance of screening programs.

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collaborators of the Hospital San Vicente Fundación de Medellín.

Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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