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Persistent hyperglycaemia associated with Diabetic Retinopathy in Type 2 Diabetic Patients of Veracruz city

Original Article

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SUMMARY

Introduction: *Diabetic retinopathy is a chronic microangiopathic complication characterized by an alteration of the retina vasculature; it represents a risk for visual loss or blindness; this risk can be reduced with stable metabolic control, early detection and adequate treatment. The general objective of the study is to determine the relationship between*

persistent hyperglycemia and diabetic retinopathy.

Methods: *An observational, cross-sectional, prospective and analytical study was conducted in diabetic patients of Veracruz city, in the period between February and May 2018. Laboratory tests (HbA1c and blood glucose), visual acuity examination and fundus identification of the presence of microaneurysms, exudates, hemorrhages and neoformations were performed; subsequently, proliferative and non-proliferative diabetic retinopathy was evaluated in both eyes*

Results: *In the control and monitoring of glucose, group I presented 202.63 ± 65.75 mg / dl and group II 143.55 ± 50.76 mg / dl. HbAIc in group I was 10.11 ± 2.5% and group 2, 8.07 ± 2.3% (p <0.001). Hemorrhage occurred in 9 of the patients (30%) with diabetic retinopathy in the right eye, as well as Neoformations in 6 patients (20%); in the left eye hemorrhages and exudates predominated in 10 patients (33.3%) as well as neoformations in 5 of them (16.7%). The correlation of the findings of patients with diabetic retinopathy and HbAIc in the right eye was r = .3296 and in the left eye r = .4306.*

Conclusions: *A moderately positive relationship was found between HbA1c levels and changes suggestive of RD.*

Key words: *Diabetic retinopathy, hyperglycemia, type 2 diabetes mellitus*

INTRODUCTION

Diabetes mellitus is a heterogeneous group of disorders that are characterized by high blood glucose levels; its most important risk factors are overweight and obesity, which are associated with physical inactivity and inadequate nutrition [1]. Its evolution is silent, progressive and irreversible, requiring management with a dynamic, structured and comprehensive perspective, focused on the patient, for prevention, control and rehabilitation [1-2].

According to the National Survey of Health and Nutrition 2016 (ENSANUT MC 2016), the majority of diabetic patients surveyed (87.8%) reported receiving medical treatment to control their disease [3]; however, the results of this survey showed that medical surveillance and prevention of complications specified in NOM-015-SSA2-2010 for prevention, treatment and control of diabetes mellitus are still far from being achieved [3-4].

Diabetic retinopathy is a chronic microangiopathic complication, characterized by an alteration of the vasculature of the retina; it develops to a variable degree in almost all patients with long evolution; it usually starts between 10 and 20 years after the onset of diabetes, and progresses faster if the disease is not diagnosed or controlled [4]. The American Diabetes Association, in its guidelines for medical care in Diabetes 2015, suggests maintaining glycemic control in an adult patient with a glycosylated hemoglobin value of less than 7% [2-3].

Diabetic retinopathy has a prevalence of 43.6% worldwide; in Mexico, a prevalence of 31.5% was found in the most extensive study to date, being the most frequent cause of blindness among the population of productive age [5-6].

The main risk factors for the development of diabetic retinopathy are

the duration of the disease, poor metabolic control, hypertension, hyperlipidemia and ignorance of the disease. The symptomatology is described as a slow and progressive loss of both unilateral and bilateral vision, or a sudden loss in some cases. Critical signs are superficial and deep retinal hemorrhages, the presence of hard exudates (extracellular deposits of lipids and serum proteins, with a predilection for the macula) or soft exudates (focal ischemic infarcts in the nerve fiber layer, with cottony imprecise edges), in addition to retinal vascular anomalies such as venous threading, venous loop, venous sheathing, intraretinal microvascular anomalies in response to focal retinal ischemia; they appear around the area of non-perfusion or neovascularization, fibrous proliferation, contraction of the vitreous or fibrous tissue [4,7].

The classification and grading of retinopathy is based on the severity of the vascular lesions, thanks to the feasibility of visualization of the internal vasculature of the retina. The classification proposed by the Early Diabetic Retinopathy Study (ETDRS), supported by the National Eye Institute, uses homogeneous classification and treatment criteria based on the anatomical characteristics of the retina and the number of microvascular lesions that can be detected photographically; however, it must be taken into account that, because it is anatomically based, the ETDRS severity scale is not a true quantitative measure and may not reflect important functional deficits [5,8,9].

The WHO global action plan for the 2014-2019 period includes Diabetic Retinopathy, with the general objective of reducing avoidable visual disability as a global public health problem and guaranteeing access to rehabilitation services for the visually impaired. The plan is based on five principles and approaches: universal access and equity, human rights, practice based on scientific data, an approach based on the entire life cycle and the empowerment of people with visual disabilities [10, 11, 12].

The objective of the study was to determine the relationship between persistent hyperglycemia and diabetic retinopathy.

METHODS

An observational, cross-sectional, prospective and analytical study was conducted during the period of February-May 2018, in 64 patients with Type 2 Diabetes Mellitus from the city of Veracruz; the following inclusion criteria were used: patients with type 2 diabetes mellitus, age 30 to 50 years and acceptance to participate in the study. The patients were divided into two groups: group 1 consisted of diabetic patients with Diabetic Retinopathy and Group 2 consisted of diabetic patients without Diabetic Retinopathy. A questionnaire was applied for personal identification data such as name, sex, age, Body Mass Index (BMI), years of disease evolution, frequency of glucose measurement and if it is currently receiving treatment.

Visual acuity was explored and, in the fundus, the presence of microaneurysms, exudates, hemorrhages and neoformations was identified; subsequently, the presence of proliferative and non-proliferative diabetic retinopathy was evaluated in both eyes. Laboratory tests were taken to measure fasting glucose and glycosylated hemoglobin with the blood chemistry analyzer H-100.

The information obtained was captured in sheets of the Excel program of the Microsoft Office 2016 package; the statistical analysis was carried out with the SPSS package version 22; inferential statistics analyzes were X2 test, Pearson correlation and Student's T test.

RESULTS

We studied 64 type 2 diabetic patients; the age of the patients in group I was 52.83 ± 9.5 years and group II 58.94 ± 10.85 years (p <0.05). Sex in group I was female in 19 patients (63%) and male in 11 patients (34%), while in group II it was female in 25 patients (73.5%) and male in 9 (26.5%); As for the years of evolution of the disease, in group I it was 12.3 ± 6.2 years and in group II it was 10.64 ± 6.16 years (Table 1).

	Diabéticos con RD (n = 30)	Diabéticos sin RD (n = 34)	p
Edad	52.83 ± 9.5	58.94 ±10.85	0.02
Sexo **Femenino** **Masculino**	 19 (63%) 11 (34%)	 25 (74%) 09 (26%)	0.48
Años de evolución	12.3 ± 6.26	10.64 ±6.16	0.76
Tratamiento **Si** **No**	 25 (83.3%) 5 (16.7%)	 32 (94.1%) 2 (5.9%)	0.61
IMC **Peso normal** **Sobrepeso** **Obesidad Grado I** **Obesidad Grado II** **Obesidad Grado III**	 7 (23%) 15 (50%) 4 (13.3) 3 (10%) 1 (3.3%)	 10 (29.4%) 13 (38.2%) 10 (29.4%) 1 (2.9%) 0	0.76

Tabla 1. Características sociodemográficas de la población estudiada (n=64)

Regarding the monitoring of serum glucose, group I presented 202.63 ± 65.75 mg / dl and group II presented 143.55 ± 50.76 mg / dl. The glycosylated hemoglobin (HbAIc) in group I was 10.11 ± 2.5% and in group 2 it was 8.07 ± 2.3% (p <0.001). The measurement of glucose by days and months was higher in the group without Diabetic Retinopathy (Table 2). In the evaluation of Visual Acuity in the right eye in the group of patients with Diabetic Retinopathy (group I) it was found that 20 patients (66.7%) had a near normal vision and 1 (3.3%) had deep low vision; in group II it was found that 18 (52.9%) patients had near-normal vision and 1 (2.9%) patient had profound low vision (not significant).

	Diabéticos con RD (n=30)		Diabéticos sin RD (n=34)		p
Tratamiento actual	n	%	n	%	
SI	25	83.3	32	94.1	0.61
NO	5	16.7	2	5.9	
Medición de la glucosa					
Diario	2	6.7	5	14.7	
7 días	4	13.3	6	17.6	
15 días	2	6.7	2	5.9	
1 – 2 meses	2	6.7	8	23.5	0.01
3 - 4 meses	4	13.3	7	20.6	
5 - 6 meses	12	40	4	11.8	
≥1 año	4	13.3	2	5.9	
Glucosa (mg/dl)	202.63 ± 65.75		143.55 ± 50.76		0.001
HbA1C (%)	10.11±2.5		8.07±2.3		0.001

Tabla 2. Control de tratamiento y monitoreo de la glucosa en pacientes diabéticos

22 patients in group I (73.3%) and 25 patients in group II (73.5%) reported not having previously had an ocular fundus examination (p = 0.98). Table 3 shows that in patients with diabetic retinopathy in the right eye, hemorrhages occurred in 9 (30%) and neoformations in 6 (20%); in the left eye hemorrhages and exudates predominated (10 patients, 33.3%) as well as neoformations (5 patients, 16.7%).

Hallazgos del fondo de ojo (n= 30)	**HEMORRAGIAS**	
	OD 9 (30%)	**OI 10(33.3%)**
	EXUDADOS	
	OD 8 (26.7%)	**OI 10(33.3%)**
	MICROANEURISMAS	
	OD 7(22.3%)	**OI 5 (16%)**
	PROLIFERACIONES	
	OD 6(20%)	**OI 5(16%)**
Paciente diagnosticado previamente retinopatia diabética (n=30)	**SI 8 (26.7%)**	**NO 22(73.3%)**

Tabla 3. Hallazgos de fondo de ojo en pacientes con Retinopatía Diabética

The correlation of the findings of patients with diabetic retinopathy and HbAIc in the right eye was r = .3296 (figure 1) and in the left eye it was r = .4306 (figure 2).

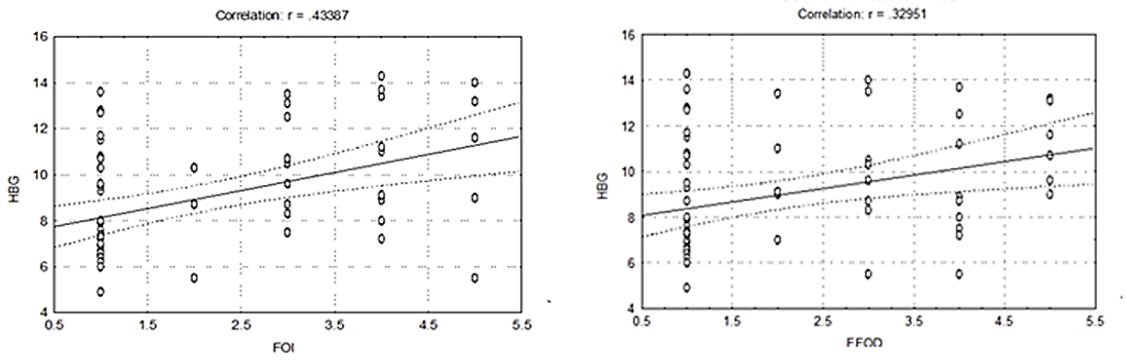

Figura 1. Análisis de Correlación de Pearson entre Hemoglobina Glucosilada y hallazgos de fondo de ojo Derecho e Izquierdo

DISCUSSION

According to the Ministry of Health, Diabetic Retinopathy has a prevalence of 43.6% worldwide; this figure is similar to the 46.9% found in our diabetic population; in Mexico, a prevalence of 31.5% was found, being the most frequent cause of blindness among the population of productive age [5].

In our study it was found that the prevalence of diabetic retinopathy by gender was presented in 19 (63.3%) women and 11 (36.7%) men, findings that coincide with data published by Cruz BIi et al, who considered diabetes mellitus do not have a prevalence of gender, contrary to Diabetic Retinopathy that has a prevalence towards female sex [15].

In this same study it is demonstrated that non-proliferative diabetic retinopathy (RDNP) is more frequent than proliferative retinopathy (PDR), presenting 80.7% and 19.3% respectively; These results are similar to that found in our study, given that 22 (73.3%) patients are classified as RDNP and 8 (26.7%) patients as PDR [14].

Hernández PA et al report in their study that 29.4% of the population had PDR, which is similar to the prevalence found in our study (26.7%). The same happens with the RDNP, given that they report an incidence of 70.6% and in our case it was 73.3% [15].

Aveleira OB reports that the most frequent age range was 61-70 years, representing 26.5% of the cases, followed by the group of 51-60 years of age. These data coincide with Delcourt C et al; this differs from that found in our study, since the highest prevalence is found in the age group of 50-59 years (43.3%) and secondly the group of 60-69 years (13.3%) [14,16] .

Regarding the time of evolution, 53.3% of our patients with RD had more than 10 years of evolution; Vila L et al report a slightly higher percentage (58.4%) [17].

Metabolic control is a fundamental pillar of therapy to avoid complications; this is demonstrated by the UK Prospective Diabetes Study (UKPDS) which confirmed that adequate glycemic control in type 2 diabetics is a beneficial factor that delays the onset of retinopathy when an intensive therapy is established that reduces HbA1C to an average of 7%. For each percentage point reduction in HbA1C there was a 35% lower risk in the development of complications [18,19].

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