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Cardiometabolic Risk Indicators for Kidney Disease in Mexican Patients with Type 2 Diabetes

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Introduction. Kidney disease is one of the main complications in the diabetic patient. Risk factors such as obesity, dyslipidemia, and hyperglycemia have been associated with increased urinary albumin excretion (UAE) and decreased glomerular filtration rates (GFR). However, the data are inconsistent. The objective of this study was to identify the primary risk factors associated with kidney disease in Mexican patients with type 2 diabetes.

Methods. A cross-sectional study was done in 395 patients with type 2 diabetes from four primary-care clinics. From fasting venous blood samples, the serum creatinine, glucose, glycated hemoglobin (HbA1c), and lipid profiles were measured. The diagnosis of diabetic kidney disease (DKD) was made by measuring GFR with the CKD-EPI equation, and the UAE from the first morning urination, according to the KDIGO 2012 Guidelines. Weight and waist circumference (WC), as well as body composition through the method of bioimpedance, were measured.

Results. Fourteen percent of the study population was diagnosed with DKD. Higher age and higher triglyceride levels were associated with a greater risk of DKD ($p < 0.05$). In a multivariate analysis, higher age (OR = 1.06, 95% CI 1.02−1.11), triglyceride level (OR = 2.4, 95% CI 1.18−4.92), WC (OR = 1.09, 95% CI 1.03−1.15), and smoking (OR 2.6, 95% CI 1.07−6.49) were associated to DKD.

Conclusion. Higher triglyceride levels, greater WC, and smoking are risk factors associated to DKD. An early diagnosis and opportune treatment for several cardiometabolic risk factors associated to DKD and cardiovascular disease should be identified and treated. Published by Elsevier Inc. on behalf of IMSS.

Key Words: Type 2 diabetes, Kidney disease, Cardiometabolic risk, Glomerular filtration rate, Albuminuria.

Introduction

Diabetes is the primary cause of kidney disease worldwide, and is considered to be the main cause of end stage renal disease (ESRD) as well as cardiovascular disease (CVD) and death (1,2). In Latin America, the incidence of ESRD increased from 119 patients per million population (pmp) in 1991, to 661 patients pmp in 2012 (3). In Mexico, the

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increased prevalence of obesity, poor glycemia control, and the elevated risk for ESRD have previously been reported in diabetic patients (4).

Based on a report on the status of kidney disease worldwide, estimations of the glomerular filtration rate (GFR) and albuminuria at primary-care centres is only performed in 21 countries (18 and 9%, respectively) (5). Kidney disease is diagnosed late in patients with diabetes even when markers of early kidney damage exist, like changes in urinary albumin excretion (UAE) and the GFR. The early diagnosis of this illness permits offering treatment that delays or reverts changes in kidney function (6,7).

Diabetic kidney disease (DKD) has been defined primarily as alterations to the UAE described as microalbuminuria (UAE of 30−300 mg/g), with progression to macroalbuminuria (UAE >300 mg/g), followed by a deterioration of the GFR. However, it has been recognized that one or both conditions can be present, including the presence of a deteriorated GFR, without alterations to the UAE (8−10).

There are several risk factors that have been associated to the development and progression of kidney disease from diabetes, among which are: hyperglycemia, uncontrolled hypertension, obesity, smoking, and dyslipidemia (11,12).

Obesity is considered a risk factor for CVD. However, its association to DKD has also been identified since a greater glomerular hyperfiltration is required to satisfy the metabolic demands in higher body weights. Previously, the association between the presence of DKD and a higher body mass index (BMI) and abdominal obesity, has been reported (13,14). The association between serum lipid levels and its relationship to DKD is still controversial; and the relationship between smoking and its effect on UAE and the decrease in GFR, is not conclusive (15,16).

Even though intensive treatment for glycemia control prevents and delays the increase in UAE and the decrease of GFR, the presence of DKD in patients without optimal glycemia control, as well as the role that obesity, dyslipidemia, and hyperglycemia among other factors have in the development of kidney disease, remains controversial (17,18).

Therefore, the objective of this study was to identify the metabolic risk factors associated to DKD in patients with type 2 diabetes (T2DM) who attended primary-care clinics in Mexico City.

Materials and Methods

A cross-sectional study included 395 T2DM patients who were enrolled in the first phase of the study, ‘‘The Efficacy of Nutritional Therapy and Education in a Multimedia System for Metabolic Control in T2DM Patients’’, which was registered in Clinical Trials.gov: NCT02441023. The study inclusion period was from March−August, 2016.

Eligibility Criteria of Patients

Patients were invited to participate from four primary-care clinics at the Mexican Social Security Institute (*IMSS*) in Mexico City. In this study were included those patients previously diagnosed with T2DM by their family physician, with or without pharmacological treatment for the illness, les than 70 years old. The patients with diagnosis of micro or macrovascular complications such as chronic kidney disease (CKD), renal replacement therapy, acute myocardial infarct (AMI), or advanced retinopathy, were excluded. The protocol was approved by the Research and Ethics Committee of the institution. Patients were invited to participate at the time they attended their clinical appointments at the primary-care clinic. After being informed of the procedures, risks and benefits, all participants were asked for, and signed, an informed consent form.

Renal Function Measurements

The UAE and creatinine were measured from the first morning urine, when there was albuminuria >30 mg/g a second test was done to confirm it. Urinary infections were discarded. Avoidance of intense physical exercise for three days prior to giving the urine sample was requested, and in females, provision of the sample during their menstrual cycle was avoided. The immunoturbidimetry method was used to perform the measurement. The GFR was measured from serum creatinine with the CKD-EPI equation (Chronic Kidney Disease Epidemiology Collaboration) (19).

The diagnosis of risk of DKD was realized with measuring the albumin in morning urine and estimating the GFR with the aforementioned formula.

Biochemical Measurements

Venous blood samples were obtained after 12 h of overnight fasting to measure the glucose, creatinine, triglycerides, total cholesterol, and HDL-c and LDL-c fractions, using the automated photometry method. Glycated hemoglobin (HbA1c) was analyzed using the method of high-performance liquid chromatography (HPLC). The tests were analyzed in a certified laboratory.

Clinical and Anthropometric Measurements

All patients were interrogated about their hereditary/family history and personal pathologic histories. A complete clinical record was performed by the participating physician. Systolic and diastolic blood pressures were assessed after subjects had been seated for at least 5 min. Two readings were recorded for each individual and the average was used for the analysis. The presence of arterial hypertension was defined in those who were previously diagnosed by their physician, confirmed by a review of the patient’s clinical record.