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ORIGINAL ARTICLE

Lipid changes and their relationship with vitamin D levels in children under 18 years with type 1 diabetes☆

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KEYWORDS
Lipids;
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Abstract
Objective: To analyze lipid changes and their relationship with 25-hydroxy vitamin D3 (25-OH-D) levels in patients under 18 years old with type 1 diabetes mellitus (T1DM).
Material and methods: A cross-sectional, descriptive study. Patients under 18 years with T1DM were enrolled by consecutive, nonrandomized sampling. Data collected included sex, age, pubertal stage, time since T1DM onset, weight, height, body mass index (BMI), waist circumference, glycosylated hemoglobin (HbA1c), 25-OH-D, total cholesterol (TC), LDL cholesterol (LDL-C), HDL cholesterol (HDL-C), and triglycerides (TG). Results were stratified by sex, age, and pubertal stage. Data were analyzed using SPSS®.
Results: Ninety patients with a mean age of 11.7 ± 3.6 years (51.1% males) and mean HbA1c levels of 7.5 ± 1.3% were enrolled. Of these, 26.6% had 25-OH-D levels <20 ng/mL and 13.3% 25-OH-D levels ≤15 ng/mL. No differences were found in 25-OH-D between patients with overweight or obesity and the rest. HDL-C levels <40 ng/mL were found in 1.1%, 34.4% had LDL-C levels ≥100 mg/dL, and 2.2% had TG levels ≥150 mg/dL. Patients with 25-OH-D <20 ng/mL had higher TG levels than the rest (76.80 ± 45.62 vs 57.55 ± 26.08; *P* = .04) in the multivariate analysis controlled for BMI, waist circumference, and HbA1c. A correlation was found between 25-OH-D and TG levels (−0.230; *P* = .029).

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Conclusions: Patients in our population with vitamin D deficiency had higher TG levels. Long-term follow-up should be performed to understand the potential impact of such levels on diabetes-related complications.
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PALABRAS CLAVE
Lípidos;
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Diabetes mellitus tipo 1

Alteraciones lipídicas y su relación con los niveles de vitamina D en menores de 18 años con diabetes tipo 1

Resumen
Objetivo: Analizar en menores de 18 años con diabetes mellitus tipo 1 (DM1) las alteraciones lipídicas y su relación con los niveles de 25 hidroxi vitamina D3 (25-OH-D).
Material y métodos: Estudio transversal y descriptivo. Se incluyen menores de 18 años con DM1 mediante un muestreo no aleatorizado consecutivo. Determinaciones: sexo, edad, estadio puberal, tiempo de evolución de la DM1, peso, talla, índice de masa corporal, perímetro abdominal, hemoglobina glucosilada (HbA1c) 25-OH-D, colesterol total, LDL-colesterol, HDL-colesterol y triglicéridos (TG). Se estratifican los resultados para sexo, edad y estadio puberal. Se analizan los datos con el programa SPSS®.
Resultados: Se recogen 90 pacientes: edad media de $11,7 \pm 3,6$ años, predominio masculino (51,1%) y HbA1c media de $7,5 \pm 1,3$%. El 26,6% presentan 25-OH-D < 20 ng/ml y el 13,3% 25-OH-D $\leq$ 15 ng/ml. No se observan diferencias en la 25-OH-D en pacientes con sobrepeso-obesidad respecto al resto. El 1,1% presentan HDL-colesterol < 40 ng/ml, el 34,4% LDL-colesterol $\geq$ 100 mg/dl y el 2,2% TG $\geq$ 150 mg/dl. Los pacientes con 25-OH-D < 20 ng/ml presentan valores superiores de TG que el resto ($76,80 \pm 45,62$ vs $57,55 \pm 26,08$; p = 0,04) en el análisis multivariante para índice de masa corporal, perímetro abdominal y HbA1c. Se observa correlación entre los niveles de 25-OH-D y los TG ($-0,230$; p = 0,029).
Conclusión: En nuestra población los pacientes con insuficiencia de vitamina D muestran valores de TG superiores. Debe realizarse un seguimiento a largo plazo para conocer las repercusiones sobre las complicaciones relacionadas con la diabetes.
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Introduction

The diagnosis of hyperlipidemia during childhood is very important for the prevention of cardiovascular disease, because lipid levels in childhood are related to the lipid profile in adulthood.[1] This appears to be particularly relevant in patients with type 1 diabetes mellitus (T1DM), a group with an increased risk of vascular complications.

Low vitamin D levels have in turn been reported as being correlated to a lipoprotein profile of increased cardiovascular risk and to the presence of other unfavorable factors, such as increased blood pressure or overweight.[2]

Few studies have been conducted to date on the relationship between vitamin D and the lipoprotein profile in pediatric patients with T1DM. This study was therefore intended to analyze changes in lipid metabolism and their relationship to 25-hydroxyvitamin D3 (25-OH-D) levels in patients under 18 years of age with T1DM.

Patients and methods

Study design and inclusion criteria

A cross-sectional, observational, descriptive study was conducted on patients diagnosed with T1DM being monitored at the pediatric endocrinology outpatient clinic of Hospital General Universitario in Ciudad Real. Data were prospectively collected from January 1 to December 31 2013, and the study sample was enrolled using consecutive, non-randomized sampling.

The inclusion criteria were as follows: the diagnosis of T1DM (positive insulin and/or glutamic acid decarboxylase and/or tyrosine phosphatase antibodies), intensive insulin therapy (at least three subcutaneous doses of rapid-acting insulin daily or two subcutaneous doses of slow-acting insulin daily, or with continuous insulin infusion systems). The exclusion criteria included: the diagnosis of any other form of diabetes, the requirement of less than three doses of subcutaneous insulin daily, T1DM duration shorter than one

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