



Original article

## Lipid profile and persistent lipid abnormalities in diabetic patients – a retrospective study

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## ABSTRACT

**Introduction:** The purposes of this study are the characterization the lipid profile and the suitability of the statins treatment according to the cardiovascular profile. Also, in statin-treated patients, we aim to determine the prevalence of persistent lipid abnormalities.

**Material and methods:** Observational and retrospective study of outpatient diabetic patients of a hospital consultation, between Jun/2014 and Jun/2015.

**Results:** Of the 199 diabetic patients included, 58.6% were treated with statins and only 13.9% were treated with statin dose adequate for its cardiovascular profile. The patients without overt cardiovascular disease had higher total cholesterol (178.0 vs 157.5 mg/dl;  $p=0.003$ ), HDL-C (51.0 vs 43.0 mg/dl;  $p=0.005$ ), LDL-C (97.0 vs 79.0 mg/dl;  $p=0.004$ ) and non-HDL-C (127.0 vs 112.5 mg/dl;  $p=0.04$ ) and higher prevalence of patients who achieved HDL-C goals (64.3 vs 33.3%;  $p<0.0001$ ). Almost half of statin-treated patients (46.8%) failed to achieve the LDL-C goals, 35.8% and 51.6% failed the triglycerides and HDL-C goals, respectively. Only 11.7% achieved all three goals. In statin-treated patients, we found a statistically significant difference between patients with and without cardiovascular disease on the prevalence of patients reaching the target HDL-C (68.1 vs 35.4%;  $p=0.001$ ). There were no differences in the prevalence of patients who achieved LDL-C and triglyceride goals.

**Discussion/conclusion:** There is a suboptimal utilization of statins and a substantial percentage of diabetic patients that do not achieve the therapeutic goals. We emphasize the need for an effort to optimize the lipid profile of diabetics in order to contribute to reducing the prevalence of cardiovascular diseases in this population.

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## Perfil lipídico e persistência de anomalias lipídicas em doentes diabéticos – um estudo retrospectivo

## RESUMO

**Introdução:** Os objetivos são a caracterização do perfil lipídico e a avaliação do tratamento com estatinas de acordo com o perfil cardiovascular. Adicionalmente, pretendemos determinar prevalências de anomalias lipídicas persistentes nos doentes tratados com estatinas.

**Materiais e métodos:** Estudo observacional e retrospectivo de diabéticos acompanhados numa consulta hospitalar entre 06/2014 e 06/2015.

**Resultados:** Dos 199 doentes, 58,6% estavam tratados com estatinas e 13,9% estavam tratados com doses de estatinas adequadas para o perfil cardiovascular. Os doentes sem doença cardiovascular (DCV) tinham níveis mais elevados de colesterol total (178,0 vs. 157,5 mg/dl;  $p=0,003$ ), HDL-C (51,0 vs. 43,0 mg/dl;  $p=0,005$ ), LDL-C (97,0 vs. 79,0 mg/dl;  $p=0,004$ ), e não-HDL-C (127,0 vs. 112,5 mg/dl;  $p=0,04$ ) e uma maior prevalência de doentes que alcançaram metas de HDL-C (64,3 vs. 33,3%;  $p<0,0001$ ). Quase metade dos doentes tratados com estatinas (46,8%) não atingiram o valor alvo de LDL-C, 35,8 e 51,6% falharam as metas de HDL-C e de triglicéridos, respetivamente. Apenas 11,7% atingiram todos os 3 objetivos. Nos

## Palavras-chave:

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doentes tratados com estatinas, encontramos diferença estatisticamente significativa entre os doentes com e sem DCV, sobre a prevalência de atingimento do alvo HDL-C (68,1 vs. 35,4%,  $p=0,001$ ). Não houve diferenças na prevalência de doentes que atingiram os objetivos de LDL-C e triglicéridos.

*Discussão e conclusão:* Verifica-se uma utilização subótima das estatinas e uma percentagem substancial de diabéticos que não alcançam os objetivos terapêuticos. Salienta-se a necessidade de um esforço para otimizar o perfil lipídico dos diabéticos de forma a contribuir para a diminuição da prevalência de DCV nesta população.

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## Introduction

Cardiovascular disease (CVD) is the leading cause of death among adult diabetic patients.<sup>1</sup> Although the multifactorial etiology of atherosclerotic vascular disease, dyslipidemia is a common and an important predictor of cardiovascular risk.<sup>2</sup> Dyslipidemia is usually present at diagnosis of type 2 diabetes and persists regardless of the treatment of hyperglycemia. The main therapy goal in the management of dyslipidemia is to decrease the levels of LDL-cholesterol (LDL-C) and other apolipoprotein-B-containing lipoproteins, which is primarily achieved with dietary modifications and statins.<sup>3,4</sup>

Data from randomized controlled trials of statin therapy show highly significant reductions in the incidence of major CVD events in diabetic patients, with or without established CVD. Moreover, the reductions in major CVD events are proportional to the reduction in LDL cholesterol. Despite the widespread evidence of the benefits of lipid-lowering treatment, particularly with statins, for reducing cardiovascular disease and mortality in diabetic patients, a considerable proportion of diabetic patients do not achieve the therapeutic goals in LDL cholesterol.<sup>5,6</sup>

The aim of this study is to characterize lipid profile of diabetic patients, according the presence or absence of previous cardiovascular event and the evaluation of the suitability of the treatment with statins according to the cardiovascular profile. Additionally, our purpose is to determine in the statin-treated patients, the prevalence of persistent lipid abnormalities.

## Material and methods

### Data sources and subjects

This article describes an observational, analytical and retrospective study of outpatient diabetic patients followed at Educational Therapy of Diabetes Consultation (CTED) in *Centro Hospitalar do Porto* (CHP), between June 2014 and June 2015. CTED is a multidisciplinary consultation composed of endocrinologists, nurses, nutritionists, psychologists and podiatrists. The main purpose of this consult is diabetes self-management education and support. The patients are referenced to this consult by family physician or by another specialty consultation in HSA.

Outpatients eligible for inclusion were age  $\geq 18$  years old. Patients were excluded if they were type 1 diabetic and if was impossible to obtain the file of the patient. The source of information was electronic or paper file.

### Data collection

Data were collected from medical records and clinical examination at the time of the consults. Demographics (age and gender) and anthropometric variables [weight, height and body mass index (BMI)] were recorded at first visit, as well as glycosylated hemoglobin (DCA2000 method). Lipid profile [total

cholesterol (TC), triglycerides (TG), LDL-C, HDL-cholesterol (HDL-C) and apolipoprotein B (apoB)] were obtained on the second visit. The measurements were made in the same laboratory, by standard hospital assays – CT, HDL-C and TG through enzymatic methods (Roche®) in freshly drawn lithium-heparin plasma samples. The value of LDL-C was calculated using the Friedewald equation ( $LDL-C = TC - HDL-C - [TG/5]$ ), if TG levels  $< 400$  mg/dl and measured directly at higher levels. Non-HDL cholesterol (non HDL-C) was also calculated ( $TC - HDL-C$ ). Apolipoproteins were measured through immunoturbidimetric assays. Because of its influence on lipid profile, we excluded thyroid dysfunction in all patients through TSH measurement by electrochemiluminescence.

The presence of cardiovascular risk factors (smoking, hypertension, dyslipidemia and physical inactivity), of diabetic kidney disease and history of cardiovascular disease (ischemic heart disease, cerebrovascular disease and peripheral artery disease) were registered.

### Definition of dyslipidemia

To determine the persistence of lipid abnormalities, in terms of dyslipidemia treatment and goals of lipid levels, it was applied the American Diabetes Association (ADA) recommendations of 2014. Accordingly, patients without overt CVD the goal of LDL-C is less than 100 mg/dl, and in individuals with overt CVD the goal of LDL-C is less than 70 mg/dl. Although the LDL-target statin therapy is the preferred strategy, additional targets are triglyceride levels less than 150 mg/dl and HDL-C superior to 40 or 50 mg/dl, in men and women, respectively.<sup>7</sup>

The lipid levels goals correspond to a range of values defined by an upper limit without a lower limit. Although the term target is commonly used interchangeably, achieving targets could result in the undertreatment of many patients who could benefit from having LDL-C, triglyceride values below the target values or HDL-C above the target value.

To analyze the suitability of the dose of statins were used the recommendations of the ADA in 2015. Therefore, diabetic patients were divided in groups considering the age and the presence or absence of overt CVD [previous cardiovascular events or acute coronary syndromes] and cardiovascular (CV) risk factors [LDL  $\geq 100$  mg/dl, high blood pressure, smoking, overweight or obesity]. Patients of all ages with diabetes and overt CVD should be medicated with an high-dose statin. Patients with diabetes under 40 years of age and with additional CVD risk factors, it should be considered using moderate or high-dose statin. For patients with diabetes aged 40–75 years without additional CVD risk factors, it should be considered using moderate-dose statin. For patients with diabetes aged 40–75 years with additional CVD risk factors, it should be considered using high-dose statin. For diabetics over 75 years old without additional CVD risk factors, it should be considered using moderate-dose statin therapy. And for patients over 75 years with additional CVD risk factors, it should be considered using moderate or high-dose statin therapy.<sup>8</sup>

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