

# Management of Dyslipidemia in Type 2 Diabetic Patient: A Case Report

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## Abstract

Diabetic dyslipidemia is characterised by high plasma triglycerides (TG), low high-density lipoprotein cholesterol (HDL-C) and increased small dense low-density lipoprotein cholesterol (LDL-C) particles. Obesity, poor glycaemic control, high fat low fibre diet, and smoking increase the risk of dyslipidemia in type 2 diabetes. Our report presents effective management of dyslipidemia in type 2 diabetics with lifestyle modifications and strict adherence to pharmacological interventions.

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## Introduction

Dyslipidemia, one of the major cardiovascular modifiable risk factors, is characterized by high levels of plasma triglycerides (TG) and small dense low-density lipoprotein cholesterol (LDL-C) particles, and low levels of high-density lipoprotein cholesterol (HDL-C) and insulin resistance [1]. It increases the risk of macrovascular and microvascular complications in type 2 diabetes [2].

We present here a case report of effective management of dyslipidemia in a type 2 diabetic with lifestyle modifications and strict adherence to pharmacological treatments.

## Case Presentation

A 60-year old man with recent-onset type 2 diabetes mellitus visited a tertiary care hospital in India. He weighed 80 kg with 5'9" in height and has a body mass index of 26 kg/m<sup>2</sup> and hypertension as 140/90 mm Hg. He had a sedentary lifestyle, mild polyphagia, and presented with nonspecific complaints of fatigue and lack of general sense of well-being. The patient had strong positive family history of cardiovascular diseases (CVD), his father had myocardial infarction (MI) which proved to be fatal, mother and elder sister had type 2 diabetes and younger brother had an ischemic stroke 5 years ago. The patient's lungs were clear to auscultate bilaterally, abdomen was soft with minimal diffuse thrombotic thrombocytopenia purpura, no rebound, and no guarding. No bruits were detected on auscultation. Laboratory reports showed HDL-C levels as 40 mg/dL, LDL-C as 125 mg/dL, TG as 140 mg/dL, fasting blood glucose as 104 mg/dL, and glycated haemoglobin (HbA1C) as 8%. Whereas, the normal range HDL-C, LDL, TG, fasting blood glucose and HbA1C were  $\geq 35$  mg/dL, 65 - 180 mg/dL, < 150 mg/dL, 60 - 110 mg/dL, and  $\leq 5.4$  %. Patient was taking metformin plus atorvastatin (500mg+10mg, once daily) for past 3 months but had poor adherence to treatment. After strict adherence to the prescribed treatment (metformin and atorvastatin) and lifestyle modifications, his HbA1C level improved to 7% and LDL-C dropped to 73 mg/dL at 3-month follow-up. However, there was no significant improvement in HDL-C and TG levels after initiation of atorvastatin. During treatment, the clinician increased the atorvastatin dose to 80 mg/day which further reduced LDL-C level. The high atorvastatin dose was well-tolerated by the patient with no elevations of alanine/aspartate aminotransferase. At 6-month follow-up, the LDL-C level again rose to 85 mg/dL, which was found to be due to suboptimal compliance with the treatment.

## Discussion

The present case report highlights how life style modification and strict adherence to treatment can effectively manage diabetic dyslipidemia in type 2 diabetes.

Lifestyle changes, including increased physical activity and dietary modifications remains the cornerstone of management of atherogenic dyslipidemia in type 2 diabetes [3-5]. In our report, when the lifestyle of the patient was modified and he strictly adhered to the treatment as suggested by the physician, his HbA1c and LDL-C levels significantly improved.

Our findings are in concordance with earlier reported literature where intensive lifestyle interventions yielded better long-term impact on cardiovascular morbidity and mortality in overweight patients with type 2 diabetes than standard diabetes support and education programs [6]. Similarly, stepwise introduction of lifestyle modification with pharmacologic interventions helped to reduce the risk of deaths (53%) due to CVD, nonfatal MI, percutaneous coronary interventions, nonfatal stroke, and coronary artery bypass grafting in patients with type 2 diabetes and microalbuminuria [7]. Metformin is most prescribed oral antidiabetic agent. The efficacy, security profile, beneficial cardio-vascular and metabolic effects, and capacity to be associated with other antidiabetic agents makes it a drug of choice for glucose lowering in treating patients with type 2 diabetes. Metformin acts primarily at the hepatic cells by two mechanisms. First, it reduces glucose output and, secondly, augments glucose uptake in the peripheral tissues, chiefly muscle. It reduces hepatic production of generation of glucose from non-carbohydrate carbon sources through an AMPK dependent pathway[8,9].

Statins, the lipid-lowering therapy, is the recommended initial pharmacological treatment for lowering LDL-C levels in "very high risk" and "high-risk" categories of type 2 diabetes. Atorvastatin is one of the most worldwide prescribed statins which inhibit 3-hydroxy-3-methyl-glutaryl Coenzyme A reductase, an enzyme of the hepatic cholesterol biosynthesis pathway, and reduces low LDL-C associated with cardiovascular mortality and morbidity. Atorvastatin improves the lipoprotein profile and oxidative status in patients with type 2 diabetic dyslipidemia. The beneficial effect of atorvastatin is also attributed to inhibition of inflammatory pathways and peroxisome proliferator activated receptor- $\alpha$  activation[10].

We also suggested atorvastatin in combination with metformin to our patient. After the use of atorvastatin, his LDL-C significantly

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reduced and with subsequent higher dose of atorvastatin (80mg/day) his LDL-C levels further decreased with no adverse events. The diabetes atorvastatin lipid intervention (DALI) study have reported that either 10 or 80 mg of atorvastatin is equally effective in the treatment of diabetic dyslipidemia [11]. In 2008, Balasubramanian et al in a study on Indian patients assessed the efficacy, safety and tolerability of a fixed dose combination of atorvastatin 10mg + metformin SR 500mg in adult Indian patients with diabetic dyslipidaemia. Further, increased dose of atorvastatin was safe in the present case [12]. This was consistent with previous study reporting that atorvastatin initiated at doses of 10, 20, 40, and 80 mg was effective and safe for the treatment of patients with dyslipidemia. It was further stated that the dose of atorvastatin should depend on the percentage reduction needed to achieve an LDL-C goal, patients with or at risk of coronary heart disease may benefit from starting therapy at a higher dose of atorvastatin [13].

Our results went parallel with earlier reported literature where high-dose statins led to significant reduction in the mean LDL-C levels and in the occurrence of major CV events (CHD, stroke, revascularizations) in comparison to low-dose statins [14]. In 2006, Shepherd et al., [15] reported high-dose statin monotherapy as safe with no treatment-related adverse events and no elevated levels of liver enzymes.

In developing and poor economic countries including India, there continues to be low medical education and awareness on effective usage of medications prescribed by doctors. The illiterate and poor patients tend to abruptly quit medication or do not stick to the prescribed dosage regimen of the medication leading to suboptimal use and clinical outcome. Hence, these patients remain undertreated for diseases that can be effectively treated. The interpretation of a recent study in patients with rheumatoid arthritis suggested that patients who were not taking their biological drug on the day agreed with their health-care professional had poorer clinical outcomes than those who did take their drug, emphasising the need for strict adherence to biological therapy in patients with this condition [16].

Strict adherence to treatment is essential to avail maximum benefits of therapy. Medication adherence is commonly defined as whether patients take their medications as prescribed (e.g., twice daily), and whether they continue to take a prescribed medication. Medication nonadherence is a growing concern to clinicians, healthcare systems, and other stakeholders (eg, payers) because of mounting evidence that it is prevalent and associated with adverse outcomes and higher costs of care [17]. Medication nonadherence is likely to grow worldwide as patients take more medications to treat chronic conditions and is common for patients with CVDs. Medication adherence potentially leads to increase in hospital visit, duration of hospital stay, suboptimal therapeutic benefit and costs of treatment.

In our study, we observed that due to suboptimal compliance of the patient to the treatment, his LDL-C levels rose from 75 to 85 mg/dL and the beneficial effects of treatment were abolished. Similar results in terms of higher risk of death, nonfatal MI and loss of beneficial effects of statins with abrupt discontinuation were reported in patients with acute coronary syndrome [18]. Hence, clinicians should underscore benefits of continuing and adhering to the prescribed statin therapy to the patients.

## Conclusion

In conclusion, there continues to be considerable lack of knowledge

among people in developing countries on dyslipidemia which can be effectively managed in type 2 diabetes patients by life-habit modifications in combination with strict adherence to pharmacological interventions. Therefore, there is a need to impart awareness on the dosage, potential side effects, benefits of continuing uninterrupted medication, by clinicians and pharmacists. This would surely translate into effective and optimised management of dyslipidemia which would potentially decrease the occurrence of dyslipidemia in diabetic patients.

## Competing Interests

The authors have declared that no competing interests exist.

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