

## **Lipid-Lowering Therapy in Elderly Patients with Type 2 Diabetes Mellitus: A Clinical Assessment of Effectiveness**

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**Abstract:** This study aimed to assess the effectiveness of pharmacological correction of atherogenic dyslipidemia in elderly patients with type 2 diabetes mellitus (T2DM) and high cardiovascular risk. A retrospective analysis of 180 outpatient medical records of elderly patients followed for five years was performed. Lipid profile parameters, the frequency and duration of statin therapy, and the rate of achievement of target low-density lipoprotein cholesterol (LDL-C) levels were evaluated. The study revealed low effectiveness of lipid-lowering therapy, which was attributable both to insufficient treatment adherence and to the use of suboptimal statin doses.

**Keywords:** Type 2 diabetes mellitus; atherogenic dyslipidemia; elderly patients; statin therapy; cardiovascular risk; LDL-cholesterol.

### **Introduction**

Type 2 diabetes mellitus (T2DM) is one of the most prevalent chronic diseases, significantly affecting overall morbidity and mortality patterns. Its clinical and social impact is particularly pronounced in elderly patients, in whom long disease duration, multiple comorbidities, and age-related metabolic changes create favorable conditions for the early development of cardiovascular complications. One of the most important factors contributing to atherosclerotic risk is atherogenic dyslipidemia—a cluster of lipid metabolism disorders characterized by elevated triglyceride levels, reduced high-density lipoprotein cholesterol (HDL-C), and increased low-density lipoprotein cholesterol (LDL-C). This type of dyslipidemia is typical of patients with T2DM and is considered a central pathogenic mechanism of atherosclerosis, promoting accelerated plaque formation and progression of coronary heart disease, stroke, and peripheral vascular disease.

In recent years, international and national clinical guidelines have emphasized the importance of early and intensive lipid control in patients with diabetes, classifying them as having very high cardiovascular risk. Particular attention is paid to achieving target LDL-C levels as the primary indicator of lipid-lowering therapy effectiveness.

One of the key challenges remains poor patient adherence to treatment, irregular statin use, and prescription of suboptimal doses, resulting in low rates of achieving lipid targets. These factors collectively limit the effectiveness of cardiovascular complication prevention in elderly patients with T2DM. Therefore, studying the characteristics of lipid-lowering therapy in real-world outpatient practice and evaluating its effectiveness in elderly patients with type 2 diabetes mellitus is highly relevant. Such studies help identify major barriers to achieving therapeutic

goals and facilitate the development of more effective management strategies for this patient population.

### **Study Objective**

To evaluate the clinical effectiveness of pharmacological interventions aimed at reducing atherogenic dyslipidemia in elderly patients with type 2 diabetes mellitus and high cardiovascular risk.

### **Materials and Methods**

This study was conducted as a retrospective analysis based on the review of 180 outpatient medical records of patients diagnosed with type 2 diabetes mellitus (T2DM). Patients were followed over a five-year period at Family Polyclinic No. 3. The analysis aimed to assess the quality and effectiveness of lipid-lowering therapy in real clinical practice.

#### **Sample characteristics:**

The study included elderly patients meeting predefined inclusion criteria. The mean age was  $71.5 \pm 8.9$  years, and the mean duration of T2DM was  $16 \pm 7.8$  years, reflecting significant comorbidity and accumulation of cardiovascular risk factors. Medical records were selected using random sampling to minimize selection bias and ensure representativeness of the cohort.

Inclusion criteria:

Diagnosed T2DM

Age  $\geq 60$  years

Confirmed cardiovascular pathology (coronary artery disease, arterial hypertension, history of vascular events, etc.)

Exclusion criteria:

Active oncological disease

Severe cognitive impairment (senile dementia)

Severe hepatic or renal dysfunction limiting the safe use of lipid-lowering therapy

Laboratory and Instrumental Assessments

The following parameters were analyzed in all patients:

- Total cholesterol (TC)
- Low-density lipoprotein cholesterol (LDL-C)
- Triglycerides (TG)
- Glycated hemoglobin (HbA1c)
- Serum creatinine and estimated glomerular filtration rate (eGFR)
- Liver transaminases (ALT, AST)
- Urinalysis
- Microalbuminuria
- Electrocardiography (ECG)
- Blood pressure measurement
- Body mass index (BMI)

Based on these data, individual cardiovascular risk was assessed.

Evaluation of Therapy Effectiveness

The frequency of statin prescription, duration of use, and tolerability were analyzed. Lipid-lowering therapy was considered effective if the target LDL-C level  $< 2.5$  mmol/L was achieved, in accordance with current clinical guidelines for patients with high and very high cardiovascular risk.

**Table 1. Main Patient Characteristics and Study Methods**

Parameter	Characteristic / Value
Total number of patients	180
Mean age, years	$71.5 \pm 8.9$
Mean duration of T2DM, years	$16 \pm 7.8$
Sampling method	Random sampling
Inclusion criteria	T2DM, age $\geq 60$ years, cardiovascular disease
Exclusion criteria	Cancer, dementia, severe liver/kidney disease
Laboratory tests	TC, LDL-C, TG, HbA1c, creatinine, eGFR, liver tests, urinalysis, microalbuminuria
Instrumental tests	ECG, blood pressure, BMI
Therapy effectiveness criterion	LDL-C $< 2.5$ mmol/L
Analyzed therapy parameters	Statin prescription rate, duration, tolerability

Data analysis showed that the vast majority of elderly patients with type 2 diabetes mellitus belonged to the high cardiovascular risk category (99.7%), highlighting pronounced comorbidity and the need for more aggressive preventive strategies. Despite this, only 20.4% of patients received recommended lipid-lowering therapy, indicating a low prescription rate in real-world clinical practice.

Among patients prescribed statins, significant differences in treatment duration were observed. Only 24.4% used statins for less than one year, while 75.6% continued therapy for more than one year. However, only 13.4% maintained regular statin use throughout the entire five-year follow-up period, demonstrating poor long-term adherence.

Reasons for statin discontinuation further reflected low compliance: in 88.9% of cases, patients discontinued therapy independently without informing their physician. Only 12.5% stopped treatment due to elevated liver enzyme levels, indicating a relatively low incidence of clinically significant adverse effects.

The effectiveness of lipid-lowering therapy was unsatisfactory. Achievement of target values for all three lipid parameters—total cholesterol, triglycerides, and LDL-C—was observed in only 1.7% of patients (2 individuals). Elevated levels were common: TC in 57.7% (104 patients), TG in 71.6% (129 patients), and LDL-C in 91.6% (165 patients). Thus, lipid metabolism disorders were highly prevalent.

Achievement of the key target—LDL-C  $< 2.5$  mmol/L—was observed in only 22.1% of patients (25 individuals), underscoring insufficient therapy intensity and the need for optimization of dyslipidemia management in this age group.

**Table 2. Main Study Results**

Parameter	Value
Patients with high cardiovascular risk	99.7%
Receiving lipid-lowering therapy	20.4%
Statin use $< 1$ year	24.4%
Statin use $> 1$ year	75.6%
Statin use for full 5 years	13.4%
Self-discontinuation of therapy	88.9%
Discontinuation due to elevated liver enzymes	12.5%
Achievement of target TC, TG, and LDL-C	1.7% (2 patients)

Elevated TC	57.7% (104 patients)
Elevated TG	71.6% (129 patients)
Elevated LDL-C	91.6% (165 patients)
Achievement of target LDL-C	22.1% (25 patients)

## Discussion

The findings highlight the ongoing problem of inadequate correction of atherogenic dyslipidemia in elderly patients with type 2 diabetes mellitus. Despite the fact that most patients had very high cardiovascular risk, optimal lipid-lowering therapy was prescribed to only a minority. In practice, statin use was significantly lower than recommended by national and international guidelines.

Low treatment adherence is of particular concern, as many patients discontinued therapy independently, suggesting insufficient awareness of the need for long-term treatment or underestimation of complication risks by both patients and physicians. Psychological factors, including exaggerated fear of adverse effects, may also play a role, especially in elderly populations.

Moreover, even among patients who continued statin therapy, achievement of lipid targets was rare. This may be due to the use of insufficiently intensive treatment regimens and lack of timely dose adjustments. Clinicians often prescribe minimal statin doses to reduce the risk of adverse effects, particularly in patients with concomitant liver or kidney disease, which is common in geriatric cohorts.

Another important limitation of real-world practice is inadequate frequency of lipid profile monitoring, leading to delayed therapy adjustments. As a result, treatment remains static despite changes in patient status.

Overall, these trends emphasize the need to enhance patient education, strengthen physician oversight, and implement more intensive lipid-lowering strategies. Improving adherence, individualizing dosing, and ensuring regular laboratory monitoring are key elements in reducing cardiovascular mortality in this vulnerable population.

## Conclusions

Atherogenic dyslipidemia remains highly prevalent among elderly patients with type 2 diabetes mellitus, with most individuals exhibiting very high cardiovascular risk requiring mandatory long-term lipid-lowering therapy.

Adherence to lipid-lowering treatment is extremely low, with many patients independently discontinuing statins, significantly reducing the effectiveness of cardiovascular prevention.

Real-world clinical practice demonstrates insufficient therapy intensity: low statin doses and lack of regular treatment adjustment result in target LDL-C levels being achieved in only a small proportion of patients.

Inadequate lipid monitoring and absence of dynamic follow-up contribute to persistent dyslipidemia and increased overall cardiovascular risk.

Improving outcomes requires enhanced patient education, increased adherence to therapy, regular laboratory monitoring, and more active use of intensive statin regimen.

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