Table 15b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia

(Last updated April 16, 2019; last reviewed April 16, 2019)  (page 1 of 2)

<table>
<thead>
<tr>
<th>Adverse Effects</th>
<th>Associated ARVs</th>
<th>Onset/Clinical Manifestations</th>
<th>Estimated Frequency</th>
<th>Risk Factors</th>
<th>Prevention/Monitoring</th>
<th>Management</th>
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</thead>
<tbody>
<tr>
<td>Dyslipidemia</td>
<td>PIs:</td>
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<td></td>
<td>• All PIs, especially RTV-boosted PIs; lower incidence reported with DRV/r and ATV with or without RTV.</td>
<td>Onset:</td>
<td>As early as 2 weeks to months after beginning therapy</td>
<td>Advanced-stage HIV disease</td>
<td>Prevention:</td>
<td>Assess all patients for additional CVD risk factors. Patients living with HIV are considered to be at moderate risk of CVD.(^b) ART regimen changes should be considered, especially when the patient is receiving older PIs (e.g., LPV/r) and/or ritonavir boosting. Substituting a PI-sparing regimen, a PI-based regimen with a more favorable lipid profile, or COBI boosting causes a decline in LDL-C or TG values. However, the lipid-lowering effect for LDL-C is less pronounced than treatment results with statin therapy. Refer patients to a lipid specialist early if LDL-C ≥ 250 mg/dL or TG ≥ 500 mg/dL. If LDL-C is ≥ 130 mg/dL but &lt; 250 mg, or TG is ≥ 150 mg/dL but &lt; 500 mg/dL, a staged treatment approach is recommended by the NHLBI guidelines.(^b) • Implement diet, nutrition, and lifestyle management for 6 months to 9 months. Consult with a dietician if one is available. • If a 6-month to 9-month trial of lifestyle modification fails and the patient is aged ≥ 10 years, consider implementing lipid-lowering therapy after consulting a lipid specialist.</td>
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<td></td>
<td>NRTIs:</td>
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<td>• Lower incidence with TDF than with TAF.</td>
<td>Presentation</td>
<td>PIs:</td>
<td>↑ LDL-C, TC, and TG</td>
<td>High-fat, high-cholesterol diet</td>
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<td></td>
<td>NNRTIs:</td>
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<td>• Lower incidence reported with NVP, RPV, and ETR than with EFV.</td>
<td>NRTIs:</td>
<td>↑ LDL-C, TC, and HDL-C</td>
<td>Lack of exercise</td>
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<td>Obesity</td>
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<td>Hypertension</td>
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<td>Smoking</td>
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<td>Family history of dyslipidemia or premature CVD</td>
<td>Monitoring:</td>
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<td>Metabolic syndrome</td>
<td>Adolescents and Adults:</td>
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<td>Fat maldistribution</td>
<td>• Obtain FLP (TC, HDL-C, non-HDL-C, LDL-C, and TG) twice (&gt;2 weeks but ≤ 3 months apart, average these results) every 6 months–12 months.</td>
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<td>Children (Aged ≥2 Years) without Lipid Abnormalities or Additional Risk Factors:</td>
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<td>• Obtain nonfasting screening lipid profiles at entry into care and then every 6 months–12 months, depending on the results.</td>
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<td>• If TG or LDL-C is elevated or if a patient has additional risk factors, obtain FLP.</td>
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<td>Children with Lipid Abnormalities and/or Additional Risk Factors:</td>
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<td></td>
<td>• Obtain 12-hour FLP before initiating or changing therapy and every 6 months thereafter (more often if indicated).</td>
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<td>Children Receiving Lipid-Lowering Therapy with Statins or Fibrates:</td>
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<td>• Obtain 12-hour FLP, LFT, and CK at 4 and 8 weeks, and 3 months after starting lipid therapy.</td>
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</tbody>
</table>

Reported frequency varies with specific ARV regimen, duration of ART, and the specific laboratory parameters used to diagnose lipid abnormalities. 10% to 20% in young children receiving LPV/r. 40% to 75% of older children and adolescents with prolonged ART history will have lipid abnormalities. Higher abnormal fasting serum lipids have been observed in ART-naïve adults who received EVG/COBI/FTC/TAF than in those who received EVG/COBI/FTC/TDF. Increase in serum lipids from baseline has also been noted in adolescents receiving EVG/COBI/FTC/TAF.
### Table 15b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia

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<table>
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<tr>
<td>Dyslipidemia, continued</td>
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</table>

- If there are minimal alterations in AST, ALT, and CK, monitor every 3 months–4 months during the first year and every 6 months thereafter (or as clinically indicated).
- Repeat FLP 4 weeks after increasing doses of antihyperlipidemic agents.
- Statin therapy should be considered for patients with elevated LDL-C levels. NHLBI provides recommendations for statin therapy in patients with specific LDL-C levels and risk factors.
- Drug therapy can be considered in cases of severe hypertriglyceridemia (TG ≥ 500 mg/dL). Fibrates (gemfibrozil and fenofibrate) and N-3 PUFAs derived from fish oils may be used.

The long-term risks of lipid abnormalities in children receiving ART are unclear. However, persistent dyslipidemia in children may lead to premature CVD.

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### Key to Acronyms:

- ALT = alanine aminotransferase
- ART = antiretroviral therapy
- ARV = antiretroviral
- AST = aspartate aminotransferase
- ATV = atazanavir
- CK = creatine kinase
- COBI = cobicistat
- CVD = cardiovascular disease
- DRV = darunavir
- DRV/r = darunavir/ritonavir
- EFV = efavirenz
- ETR = etravirine
- EVG = elvitegravir
- FLP = fasting lipid profile
- FTC = emtricitabine
- HDL-C = high-density lipoprotein cholesterol
- INSTI = integrase strand transfer inhibitor
- LDL-C = low-density lipoprotein cholesterol
- LFT = liver function test
- LPV/r = lopinavir/ritonavir
- NHLBI = National Heart, Lung, and Blood Institute
- NNRTI = non-nucleoside reverse transcriptase inhibitor
- NRTI = nucleoside reverse transcriptase inhibitor
- NVP = nevirapine
- PI = protease inhibitor
- PUFA = polyunsaturated fatty acid
- RPV = rilpivirine
- RTV = ritonavir
- TAF = tenofovir alafenamide
- TC = total cholesterol
- TDF = tenofovir disoproxil fumarate
- TG = triglyceride

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### References


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*Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection*


