Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection

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

(*Last updated April 16, 2019; last reviewed April 16, 2019*)

<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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dyslipidemia</strong></td>
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<tr>
<td>PIs:</td>
<td>All PIs, especially RTV-boosted PIs; lower incidence reported with DRV/r and ATV with or without RTV.</td>
<td>Onset: As early as 2 weeks to months after beginning therapy</td>
<td>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-naive 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.</td>
<td>Advanced-stage HIV disease High-fat, high-cholesterol diet Lack of exercise Obesity Hypertension Smoking Family history of dyslipidemia or premature CVD Metabolic syndrome Fat maldistribution</td>
<td>Prevention: • Low-fat diet • Exercise • Smoking-prevention counseling</td>
<td>Assess all patients for additional CVD risk factors. Patients living with HIV are considered to be at moderate risk of CVD. 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.</td>
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<tr>
<td>NRTIs:</td>
<td>Lower incidence with TDF than with TAF</td>
<td>Presentation PIs: ↑ LDL-C, TC, and TG</td>
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<tr>
<td>NNRTIs:</td>
<td>Lower incidence reported with NVP, RPV, and ETR than with EFV</td>
<td>Presentation NNRTIs: ↑ LDL-C, TC, and HDL-C</td>
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<tr>
<td>NRTIs:</td>
<td>Lower incidence reported with NVP, RPV, and ETR than with EFV</td>
<td>Presentation NRTIs: ↑ LDL-C, TC, and TG</td>
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### Table 15b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia

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

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</tr>
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<tbody>
<tr>
<td>Dyslipidemia, continued</td>
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<td>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).</td>
<td></td>
<td>• 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.&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>• Repeat FLP 4 weeks after increasing doses of antihyperlipidemic agents.</td>
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<td>• 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.</td>
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</tbody>
</table>

<sup>a</sup> Given the burden of collecting fasting blood samples, some practitioners routinely measure cholesterol and triglycerides from nonfasting blood samples and follow up abnormal values with a test done in the fasted state.

<sup>b</sup> Refer to the NHLBI guidelines: Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents.

**Key to Acronyms:**
- ALT = alanine aminotransferase
- 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
- PUAFA = polyunsaturated fatty acid
- RPV = rilpivirine
- RTV = ritonavir
- TAF = tenofovir alafenamide
- TC = total cholesterol
- TDF = tenofovir disoproxil fumarate
- TG = triglyceride

**References**


