### 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>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslipidemia</td>
<td>PIs:</td>
<td>Onset:</td>
<td>Reported frequency varies with specific ARV regimen, duration of ART, and the specific laboratory parameters used to diagnose lipid abnormalities.</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.¹</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>As early as 2 weeks to months after beginning therapy</td>
<td>10% to 20% in young children receiving LPV/r.</td>
<td>High-fat, high-cholesterol diet</td>
<td>• Low-fat diet</td>
<td>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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<td>NRTIs:</td>
<td>Presentation PIs:</td>
<td>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.</td>
<td>Lack of exercise</td>
<td>When possible, use ARVs associated with a lower prevalence of dyslipidemia. These include INSTIs and newer PIs (e.g., ATV, DRV).</td>
<td>Refer patients to a lipid specialist early if LDL-C ≥250 mg/dL or TG ≥500 mg/dL.</td>
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<td>• Lower incidence with TDF than with TAF</td>
<td>LDL-C, TC, and TG</td>
<td>Increase in serum lipids from baseline has also been noted in adolescents receiving EVG/COBI/FTC/TAF.</td>
<td>Obesity</td>
<td>Monitoring¹: Adolescents and Adults:</td>
<td>If LDL-C is ≥130 mg/dL but &lt;250 mg/dL or TG is ≥150 but &lt;500 mg/dL, a staged treatment approach is recommended by the NHLBI guidelines.²</td>
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<td>NNRTIs:</td>
<td>LDL-C, TC, and HDL-C</td>
<td>If TG or LDL-C is elevated or if a patient has additional risk factors, obtain FLP.</td>
<td>Hypertension</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. Children (Aged ≥2 Years) without Lipid Abnormalities or Additional Risk Factors:</td>
<td>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>• Lower incidence reported with NVP, RPV, and ETR than with EFV</td>
<td>LDL-C, TC, and TG</td>
<td>Obtain nonfasting screening lipid profiles at entry into care and then every 6 months–12 months, depending on the results.</td>
<td>Smoking</td>
<td>Children with Lipid Abnormalities and/or Additional Risk Factors:</td>
<td>• Implement diet, nutrition, and lifestyle management for 6 months to 9 months. Consult with a dietician if one is available;</td>
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<td>If TG or LDL-C is elevated or if a patient has additional risk factors, obtain FLP.</td>
<td>Smoking history of dyslipidemia or premature CVD</td>
<td>• Obtain 12-hour FLP before initiating or changing therapy and every 6 months thereafter (more often if indicated). Children Receiving Lipid-Lowering Therapy with Statins or Fibrates:</td>
<td>• 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>Metabolic syndrome</td>
<td>• Obtain 12-hour FLP, LFT, and CK at 4 and 6 weeks, and 3 months after starting lipid therapy.</td>
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<td>Fat maldistribution</td>
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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
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| Dyslipidemia, continued | | | | | 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). | 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. |

*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.*


**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; PUFAs = polyunsaturated fatty acids; RPV = rilpivirine; RTV = ritonavir; TAF = tenofovir alafenamide; TC = total cholesterol; TDF = tenofovir disoproxil fumarate; TG = triglyceride

**References**


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

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