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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<tbody>
<tr>
<td>Dyslipidemia</td>
<td>PIs:</td>
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|                 | • All PIs, especially RTV-boosted PIs; lower incidence reported with DRV/r and ATV with or without RTV. | Onset:  
  • As early as 2 weeks to months after beginning therapy | 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. | 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 | Prevention:  
  • Low-fat diet  
  • Exercise  
  • Smoking-prevention counseling  
  • When possible, use ARVs associated with a lower prevalence of dyslipidemia. These include INSTIs and newer PIs (e.g., ATV, DRV). | Assess all patients for additional CVD risk factors. Patients living with HIV are considered to be at moderate risk of CVD.²  
  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. |
|                 | NRTIs:          |                              |                     |             |                       |            |
|                 | • Lower incidence with TDF than with TAF | Presentation  
  PIs:  
  • ↑ LDL-C, TC, and TG | 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. | | | |
|                 | NNRTIs:         |                              |                     |             |                       |            |
|                 | • Lower incidence reported with NVP, RPV, and ETR than with EFV | | | | | |

Adolescents and Adults:  
• Obtain FLP (TC, HDL-C, non-HDL-C, LDL-C, and TG) twice (>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:  
• Obtain nonfasting screening lipid profiles at entry into care and then every 6 months–12 months, depending on the results.  
If TG or LDL-C is elevated or if a patient has additional risk factors, obtain FLP.  
Children with Lipid Abnormalities and/or Additional Risk Factors:  
• 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:  
• Obtain 12-hour FLP, LFT, and CK at 4 and 8 weeks, and 3 months after starting lipid therapy.  
• 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.
Table 15b. Antiretroviral Therapy-Associated Adverse Effects and Management Recommendations—Dyslipidemia
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</thead>
<tbody>
<tr>
<td>Dyslipidemia, continued</td>
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- 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.

Key to Acronyms:
- ALT = alanine aminotransferase; ARV = antiretroviral; AST = aspartate aminotransferase; ATV = atazanavir; CK = creatine kinase; COBI = cobicistat; CVD = cardiovascular disease; DRV = darunavir; DRV/ri = 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/ri = 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

References


Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection

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