

Initial Evaluation and Continued Monitoring of HIV During Pregnancy

Updated: March 31, 2026

Reviewed: March 31, 2026

Panel's Recommendations
- Plasma HIV RNA levels should be monitored at the initial antenatal visit with a review of prior HIV RNA levels (AI), 2–4 weeks after initiating (or changing) antiretroviral therapy (ART) (BI), monthly until RNA levels are undetectable (BIII), and then at least every 3 months during pregnancy (BIII). HIV RNA levels also should be assessed at approximately 36 weeks of gestation, or within 4 weeks of planned birth, to inform decisions about mode of birth, the need for intrapartum intravenous zidovudine administration (see Intrapartum HIV Care), and to inform decisions about optimal management for the newborn (see Antiretroviral Management of Infants With In Utero, Intrapartum, or Breastfeeding Exposure to HIV) (AIII). - CD4 T lymphocyte (CD4) cell count should be measured at the initial antenatal visit with review of prior CD4 counts (AI). Patients who have been on ART for ≥2 years and have had consistent viral suppression and CD4 counts consistently ≥300 cells/mm³ do not need to have their CD4 counts monitored after the initial antenatal visit during this pregnancy, per the Adult and Adolescent Antiretroviral Guidelines (CIII). Patients who have been on ART for <2 years and have CD4 counts of <300 cells/mm³, those with inconsistent adherence, or those with detectable viral loads should have CD4 counts monitored every 3 months during pregnancy; patients on ART for <2 years and with CD4 counts ≥300 cells/mm³ should have CD4 counts monitored every 6 months (CIII). - HIV drug–resistance testing (genotypic testing and, if indicated, phenotypic testing) should be reviewed in conjunction with antiretroviral (ARV) history (if prior results are available) and performed during pregnancy in those whose HIV RNA levels are above the threshold for resistance testing (usually >500 copies/mL to 1,000 copies/mL but may be possible for HIV RNA >200 copies/mL to ≤500 copies/mL in some laboratories). Testing should be conducted before— - Initiating ART in pregnancy when ARV drugs have never been taken previously and testing for ARV drug resistance has not been conducted previously (AII); - Initiating ART in pregnancy when ARV drugs have been taken previously (including those who have received pre-exposure prophylaxis) (AIII); or - Modifying ARV regimens in pregnancy when virologic failure or suboptimal viral load reduction have occurred (AII); testing will assist with selecting active drugs. See Antiretroviral Drug Resistance and Resistance Testing in Pregnancy. - ART should be initiated in pregnancy before receiving the results of drug-resistance tests. ART should be modified, if necessary, based on the results of resistance testing (AII). - Laboratory testing to monitor complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs being taken (AIII). - Standard gestational diabetes screening should be conducted (AIII).
Rating of Recommendations: A = Strong; B = Moderate; C = Optional Rating of Evidence: I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Viral Load and CD4 T Lymphocyte Cell Count Testing and Monitoring

Viral loads should be monitored more frequently during pregnancy than in nonpregnant individuals because of the importance of rapid and sustained viral suppression through birth in preventing perinatal HIV transmission (see [Table 5](#) below). When there is adherence to antiretroviral therapy (ART) and resistance mutations to the prescribed drugs are not present, viral suppression should generally be achieved within 3 to 12 weeks on preferred regimens, such as integrase inhibitor–based ART, depending on the initial viral load.^{1–4} Higher viral loads and lower CD4 T lymphocyte (CD4) cell counts are more likely to require more time to achieve viral suppression^{5,6} than lower viral loads and higher CD4 counts. Those using integrase strand transfer inhibitors (INSTIs) are more likely to achieve suppression in much shorter time frames.^{7–9} Most patients with adequate viral response at 24 weeks of treatment have had at least a 1 log₁₀ viral load decrease within 1 to 4 weeks after starting therapy.^{10,11}

Viral load should be monitored during pregnancies impacted by HIV at the initial clinic visit with a review of prior viral load levels, 2 to 4 weeks after initiating or changing ART, monthly until undetectable, and at least every 3 months thereafter. If adherence is a concern, especially during early pregnancy, more frequent monitoring is recommended because of the increased risk of perinatal HIV transmission associated with detectable HIV viremia during pregnancy.^{12–14} Similarly, pregnancy may reduce the drug exposure levels or the efficacy of some drugs; patients who are taking these drugs may require a change in therapy or more frequent viral load monitoring (see [Table 6](#) and [Table 7](#)). More frequent viral load monitoring is recommended for those who are on regimens containing rilpivirine or cobicistat-boosted elvitegravir, atazanavir, or darunavir. Although increasing the frequency of viral load monitoring may help detect viral rebound, this may be difficult to implement if visit attendance or access to viral load monitoring is limited. In addition, viremia detected in late pregnancy may be challenging to manage, requiring medication changes shortly before delivery (see [When Antiretroviral Therapy Is Being Taken When Pregnancy Occurs](#)).

Viral load also should be assessed at approximately 36 weeks of gestation, or within 4 weeks of planned birth, to inform decisions about the mode of infant birth, the need for intrapartum intravenous zidovudine administration, and optimal treatment for newborns (see [Intrapartum HIV Care](#)).

For pregnancies impacted by HIV, CD4 count should be measured at the initial clinic visit with a review of prior CD4 counts (see [Table 5](#) below). There is a physiologic decrease in CD4 counts during pregnancy.^{15,16} For patients who have been on ART for ≥2 years, have had consistent viral suppression and CD4 counts consistently >300 cells/mm³, are **adherent, and** are tolerating ART during pregnancy, CD4 count should be monitored only at the initial antenatal visit; CD4 counts do not need to be repeated for these patients during this pregnancy, per the [Adult and Adolescent Antiretroviral Guidelines](#).^{10,17,18} Patients who have been on ART for <2 years and have CD4 counts of <300 cells/mm³, those with inconsistent adherence, or those with detectable viral loads should have CD4 counts monitored **at least** every 3 months during pregnancy. Patients who have been on ART for <2 years and have CD4 counts of ≥300 cells/mm³ should have CD4 counts monitored every 6 months. The safety of this approach is supported by research that demonstrates that patients who are stable on ART (defined as patients who have viral load levels <50 copies/mL and CD4 counts >500 cells/mm³ for at least 1 year) are highly unlikely to experience a CD4 count <350 cells/mm³ in the span of a year.¹⁹

HIV Drug–Resistance Testing

During pregnancies among patients with HIV, HIV drug–resistance testing should be reviewed in conjunction with ARV history, if prior results are available, and performed during pregnancies before

starting or modifying ART if HIV RNA levels are above the threshold for standard resistance testing (usually >500 copies/mL to 1,000 copies/mL but may be possible for HIV RNA >200 copies/mL to ≤500 copies/mL in some laboratories) (see [Table 5](#) below). Genotypic testing is the **preferred resistance testing to guide therapy**. In cases when there is treatment experience with suspected multidrug resistance and failing regimens are currently being taken, phenotypic testing also should be performed. See [Drug-Resistance Testing](#) in the [Adult and Adolescent Antiretroviral Guidelines](#) and [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#) for more information on resistance testing, including considerations regarding INSTI genotypic resistance testing. ART should not be delayed while waiting for resistance test results. If the results demonstrate resistance, then the regimen can be adjusted subsequently. HIV drug–resistance testing also should be performed on patients who are on ART but have suboptimal viral suppression (i.e., failure to achieve undetectable levels of virus during an appropriate time frame, as noted above) or sustained viral rebound to detectable levels after prior viral suppression on ART (see [Lack of Viral Suppression While on Antiretroviral Therapy in Pregnancy](#) and [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#)). Drug-resistance testing in the setting of virologic failure is most useful when it is performed while patients are receiving ARV drugs or within 4 weeks after discontinuing ARV drugs. Even if more than 4 weeks have elapsed since the ARV drugs were discontinued, resistance testing can still provide useful information to guide therapy, although it may not detect all resistance mutations that were selected by previous ARV regimens.

Other Laboratory Testing and Monitoring

The laboratory tests that are assessed initially and used to monitor complications of ARV drugs during pregnancy should be chosen based on what is known about the adverse effects of the drugs a patient is receiving (see [Table 5](#) below). For example, HLA-B*5701 testing should be performed if the use of abacavir is anticipated.²⁰⁻²⁴ Routine renal monitoring is recommended for patients who are receiving tenofovir-containing regimens. Liver function should be monitored in all patients who are receiving ART, ideally within 2 to 4 weeks after initiating or changing ARV drugs and approximately every 3 months thereafter or as needed for other clinical care. Hepatic dysfunction has been observed in pregnant women on protease inhibitors (PIs), and the use of any PI during pregnancy has been associated with higher rates of liver function test abnormalities than the rates observed with **most** non-nucleoside reverse transcriptase inhibitor–based ART. Pregnant women in general are more likely than their nonpregnant counterparts to have elevated levels of liver enzymes.²⁵⁻²⁷

Pregnancy itself increases the risk of glucose intolerance. In a meta-analysis, the pooled prevalence of gestational diabetes among women with HIV was 4.42% (95% confidence interval, 3.48% to 5.35%). These rates do not appear to be higher than those in non-HIV populations.^{28,29} The majority of studies in pregnant women have not demonstrated an association between HIV infection and gestational diabetes, **including those studying women prescribed tenofovir alafenamide/INSTI–based ART**.³⁰⁻³³ However, other studies did show an increased risk of gestational diabetes.³⁴⁻³⁶ In addition, one study and several case series in nonpregnant adults with HIV have reported an increased risk for incident diabetes after initiation of INSTIs.³⁷⁻⁴¹ When ART is being taken during a pregnancy impacted by HIV, the standard screening for gestational diabetes that is recommended during all pregnancies should be conducted (see [Table 5](#) below).⁴²

Table 5. HIV-Related Laboratory Monitoring Schedule During Pregnancy^a

Laboratory Test	Timepoint or Frequency of Testing						
	Entry Into Antenatal Care ^b	ART Initiation or Modification	2 to 4 Weeks After ART Initiation or Modification	Monthly	Every 3 Months During Pregnancy	At 24 to 28 Weeks Gestation	At Approximately 36 Weeks of Gestation or Within 4 Weeks of Planned Delivery
HIV RNA Levels ^c	✓ ^b	✓ If a result is not available within 2 weeks of ART initiation or modification	✓	✓ Until HIV RNA levels are undetectable	✓ At least every 3 months ^d		✓
CD4 Count ^e	✓ ^b				✓ Patients who have been on ART for <2 years and have CD4 counts of <300 cells/mm ³ , those with inconsistent adherence, or those with detectable viral loads should have CD4 counts monitored every 3 months during pregnancy. ^e		
Resistance Testing ^f		✓					

Table 5. HIV-Related Laboratory Monitoring Schedule During Pregnancy

Laboratory Test	Timepoint or Frequency of Testing						
	Entry Into Antenatal Care ^b	ART Initiation or Modification	2 to 4 Weeks After ART Initiation or Modification	Monthly	Every 3 Months During Pregnancy	At 24 to 28 Weeks Gestation	At Approximately 36 Weeks of Gestation or Within 4 Weeks of Planned Delivery
HLA-B*5701 Testing		✓ If ABC use is anticipated					
Standard Screening for Gestational Diabetes ^g						✓	
Complete Blood Cell Count; Renal Function	✓	✓ With additional testing as clinically indicated					
Liver Function	✓	✓			✓ With additional testing as clinically indicated		
Monitoring for ARV-Specific Toxicities ^h	Refer to the recommendations in the package inserts for the individual ARV drugs.						

^a For additional information, see [Laboratory Testing](#) in the [Adult and Adolescent Antiretroviral Guidelines](#).

^b Prior HIV-related illnesses and past plasma HIV RNA levels and CD4 counts should be reviewed at entry into antenatal care.

Table 5. HIV-Related Laboratory Monitoring Schedule During Pregnancy

^c The plasma HIV RNA levels of pregnancies impacted by HIV should be monitored at the initial antenatal visit with a review of prior HIV RNA levels **(AI)**, 2 to 4 weeks after initiating (or changing) ART **(BI)**, monthly until RNA levels are undetectable **(BIII)**, and then at least every 3 months during pregnancy **(BIII)**. Obtain an HIV RNA level at the time of ART initiation or modification if a recent result within 2 weeks prior is not available.

^d More frequent viral load monitoring (every 1–2 months) may be indicated for patients who are taking ARVs that have been shown to have reduced drug levels in the second and third trimesters (e.g., cobicistat, elvitegravir, rilpivirine) and are potentially at risk for loss of viral suppression (see [Table 6](#), [Table 7](#), and [When Antiretroviral Therapy Is Being Taken When Pregnancy Occurs](#)).

^e CD4 count should be measured at the initial antenatal visit **(AI)**. Patients who have been on ART for ≥ 2 years and who have had consistent viral suppression and CD4 counts that are consistently >300 cells/mm³ do not need to have their CD4 counts monitored after the initial antenatal visit during this pregnancy, per the [Adult and Adolescent Antiretroviral Guidelines](#) **(CIII)**. Patients who have been on ART for <2 years and have CD4 counts of <300 cells/mm³, those with inconsistent adherence, or those with detectable viral loads should have CD4 counts monitored every 3 months during pregnancy **(CIII)**. Those on ART for <2 years and with CD4 counts >300 cells/mm³ should have CD4 monitored every 6 months.

^f ARV drug-resistance testing (genotypic testing and, if indicated, phenotypic testing) should be performed in patients whose HIV RNA levels are above the threshold for standard resistance testing (usually >500 copies/mL to 1,000 copies/mL but may be possible for HIV RNA >200 copies/mL to ≤ 500 copies/mL in some laboratories). Testing should be performed before—

- Initiating ART in pregnancy when ARV drugs were never taken previously and testing for ARV drug resistance was not previously conducted **(AII)**;
- Initiating ART in pregnancy when ARV drugs were previously being taken **(AIII)**; or
- Modifying ARV regimens in pregnancy when virologic failure or suboptimal viral load reduction have occurred **(AII)**; testing will assist with selecting active drugs.

ART should be initiated in pregnancy prior to receiving the results of ARV-resistance tests. ART should be modified, if necessary, based on the results of the resistance tests **(BIII)**.

^g Patients who are taking ART during pregnancy should undergo standard gestational diabetes screening **(AIII)**.

^h Laboratory testing to monitor complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs being taken (e.g., hematologic monitoring for those receiving ART regimens containing zidovudine, serum creatinine monitoring for those receiving ART regimens containing tenofovir) **(AIII)**.

Key: ABC = abacavir; ART = antiretroviral therapy; ARV = antiretroviral; CD4 = CD4 T lymphocyte

References

1. NAMSAL ANRS 12313 Study Group, Kouanfack C, Mpoudi-Etame M, et al. Dolutegravir-based or low-dose efavirenz-based regimen for the treatment of HIV-1. *N Engl J Med*. 2019;381(9):816-826. Available at: <https://pubmed.ncbi.nlm.nih.gov/31339676>.
2. Pyngottu A, Scherrer AU, Kouyos R, et al. Predictors of virological failure and time to viral suppression of first-line integrase inhibitor-based antiretroviral treatment. *Clin Infect Dis*. 2021;73(7):e2134-e2141. Available at: <https://pubmed.ncbi.nlm.nih.gov/33095848>.
3. Zhu J, Rozada I, David J, et al. The potential impact of initiating antiretroviral therapy with integrase inhibitors on HIV transmission risk in British Columbia, Canada. *EClinicalMedicine*. 2019;13:101-111. Available at: <https://pubmed.ncbi.nlm.nih.gov/31517267>.
4. Venter WDF, Moorhouse M, Sokhela S, et al. Dolutegravir plus two different prodrugs of tenofovir to treat HIV. *N Engl J Med*. 2019;381(9):803-815. Available at: <https://pubmed.ncbi.nlm.nih.gov/31339677>.
5. Aziz N, Sokoloff A, Kornak J, et al. Time to viral load suppression in antiretroviral-naïve and -experienced HIV-infected pregnant women on highly active antiretroviral therapy: implications for pregnant women presenting late in gestation. *BJOG*. 2013;120(12):1534-1547. Available at: <https://pubmed.ncbi.nlm.nih.gov/23924192>.
6. Snippenburg W, Nellen F, Smit C, et al. Factors associated with time to achieve an undetectable HIV RNA viral load after start of antiretroviral treatment in HIV-1-infected pregnant women. *J Virus Erad*. 2017;3(1):34-39. Available at: <https://pubmed.ncbi.nlm.nih.gov/28275456>.
7. Kintu K, Malaba TR, Nakibuka J, et al. Dolutegravir versus efavirenz in women starting HIV therapy in late pregnancy (DolPHIN-2): an open-label, randomised controlled trial. *Lancet HIV*. 2020;7(5):e332-e339. Available at: <https://pubmed.ncbi.nlm.nih.gov/32386721>.
8. Rahangdale L, Cates J, Potter J, et al. Integrase inhibitors in late pregnancy and rapid HIV viral load reduction. *Am J Obstet Gynecol*. 2016;214(3):385 e381-387. Available at: <https://pubmed.ncbi.nlm.nih.gov/26928154>.
9. Joao EC, Morrison RL, Shapiro DE, et al. Raltegravir versus efavirenz in antiretroviral-naïve pregnant women living with HIV (NICHDP1081): an open-label, randomised, controlled, phase 4 trial. *Lancet HIV*. 2020;7(5):e322-e331. Available at: <https://pubmed.ncbi.nlm.nih.gov/32386720>.
10. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV. 2023. Available at: <https://clinicalinfo.hiv.gov/en/guidelines/hiv-clinical-guidelines-adult-and-adolescent-arv/whats-new>.
11. Read PJ, Mandalia S, Khan P, et al. When should HAART be initiated in pregnancy to achieve an undetectable HIV viral load by delivery? *AIDS*. 2012;26(9):1095-1103. Available at: <https://pubmed.ncbi.nlm.nih.gov/22441248>.
12. Garcia PM, Kalish LA, Pitt J, et al. Maternal levels of plasma human immunodeficiency virus type 1 RNA and the risk of perinatal transmission. Women and Infants Transmission Study Group. *N Engl J Med*. 1999;341(6):394-402. Available at: <https://pubmed.ncbi.nlm.nih.gov/10432324>.

13. Townsend CL, Byrne L, Cortina-Borja M, et al. Earlier initiation of ART and further decline in mother-to-child HIV transmission rates, 2000–2011. *AIDS*. 2014;28(7):1049-1057. Available at: <https://pubmed.ncbi.nlm.nih.gov/24566097>.
14. Mandelbrot L, Tubiana R, Le Chenadec J, et al. No perinatal HIV-1 transmission from women with effective antiretroviral therapy starting before conception. *Clin Infect Dis*. 2015;61(11):1715-1725. Available at: <https://pubmed.ncbi.nlm.nih.gov/26197844>.
15. Boucoiran I, Côté HCF, Jodoin C, et al. Variations in CD4 counts during pregnancy in women living with HIV. *HIV Med*. 2024;25(2):254-261. Available at: <https://pubmed.ncbi.nlm.nih.gov/37879717>.
16. Ekouevi DK, Inwoley A, Tonwe-Gold B, et al. Variation of CD4 count and percentage during pregnancy and after delivery: implications for HAART initiation in resource-limited settings. *AIDS Res Hum Retroviruses*. 2007;23(12):1469-1474. Available at: <https://pubmed.ncbi.nlm.nih.gov/18160003>.
17. Gale HB, Gitterman SR, Hoffman HJ, et al. Is frequent CD4+ T-lymphocyte count monitoring necessary for persons with counts ≥ 300 cells/ μ L and HIV-1 suppression? *Clin Infect Dis*. 2013;56(9):1340-1343. Available at: <https://pubmed.ncbi.nlm.nih.gov/23315315>.
18. Girard PM, Nelson M, Mohammed P, et al. Can we stop CD4+ testing in patients with HIV-1 RNA suppression on antiretroviral treatment? *AIDS*. 2013;27(17):2759-2763. Available at: <https://pubmed.ncbi.nlm.nih.gov/23842127>.
19. Di Biagio A, Ameri M, Sirello D, et al. Is it still worthwhile to perform quarterly CD4+ T lymphocyte cell counts on HIV-1 infected stable patients? *BMC Infect Dis*. 2017;17(1):127. Available at: <https://pubmed.ncbi.nlm.nih.gov/28166729>.
20. Hetherington S, Hughes AR, Mosteller M, et al. Genetic variations in HLA-B region and hypersensitivity reactions to abacavir. *Lancet*. 2002;359(9312):1121-1122. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/11943262>.
21. Hetherington S, McGuirk S, Powell G, et al. Hypersensitivity reactions during therapy with the nucleoside reverse transcriptase inhibitor abacavir. *Clin Ther*. 2001;23(10):1603-1614. Available at: <https://pubmed.ncbi.nlm.nih.gov/11726000>.
22. Mallal S, Nolan D, Witt C, et al. Association between presence of HLA-B*5701, HLA-DR7, and HLA-DQ3 and hypersensitivity to HIV-1 reverse-transcriptase inhibitor abacavir. *Lancet*. 2002;359(9308):727-732. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/11888582>.
23. Mallal S, Phillips E, Carosi G, et al. HLA-B*5701 screening for hypersensitivity to abacavir. *N Engl J Med*. 2008;358(6):568-579. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/18256392>.
24. Saag M, Balu R, Phillips E, et al. High sensitivity of human leukocyte antigen-b*5701 as a marker for immunologically confirmed abacavir hypersensitivity in White and Black patients. *Clin Infect Dis*. 2008;46(7):1111-1118. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/18444831>.
25. Huntington S, Thorne C, Anderson J, et al. Does pregnancy increase the risk of ART-induced hepatotoxicity among HIV-positive women? *J Int AIDS Soc*. 2014;17(4 Suppl 3):19486. Available at: <https://pubmed.ncbi.nlm.nih.gov/25393995>.

26. Huntington S, Thorne C, Newell ML, et al. Pregnancy is associated with elevation of liver enzymes in HIV-positive women on antiretroviral therapy. *AIDS*. 2015;29(7):801-809. Available at: <https://pubmed.ncbi.nlm.nih.gov/25710412>.
27. Sibiude J, Warszawski J, Tubiana R, et al. Liver enzyme elevation in pregnant women receiving antiretroviral therapy in the ANRS-French Perinatal Cohort. *J Acquir Immune Defic Syndr*. 2019;81(1):83-94. Available at: <https://pubmed.ncbi.nlm.nih.gov/30702449>.
28. Biadgo B, Ambachew S, Abebe M, Melku M. Gestational diabetes mellitus in HIV-infected pregnant women: a systematic review and meta-analysis. *Diabetes Res Clin Pract*. 2019;155:107800. Available at: <https://pubmed.ncbi.nlm.nih.gov/31362053>.
29. Jiwani A, Marseille E, Lohse N, et al. Gestational diabetes mellitus: results from a survey of country prevalence and practices. *J Matern Fetal Neonatal Med*. 2012;25(6):600-610. Available at: <https://pubmed.ncbi.nlm.nih.gov/21762003>.
30. Samuels EON, Isah AY, Offiong RA, Ekele BA. Foeto-maternal outcome of HIV-positive pregnant women on highly active antiretroviral therapy. *Int J Med Biomed Res*. 2014;3(3):202-208. Available at: <https://www.ajol.info/index.php/ijmbr/article/download/111608/101385>.
31. Mmasa KN, Powis K, Sun S, et al. Gestational diabetes in women living with HIV in Botswana: lower rates with dolutegravir- than with efavirenz-based antiretroviral therapy. *HIV Med*. 2021;Epub ahead of print. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/34003565>.
32. Bukasa LL, Cortina-Borja M, Peters H, et al. Gestational diabetes in women living with HIV in the UK and Ireland: insights from population-based surveillance data. *J Int AIDS Soc*. 2023;26(4):e26078. Available at: <https://pubmed.ncbi.nlm.nih.gov/37012900>.
33. Eke AC, Ramaiyer M, Eleje GU, et al. A systematic review and meta-analysis of maternal weight changes and pregnancy outcomes associated with integrase inhibitors and tenofovir alafenamide in pregnant women with HIV. *Am J Obstet Gynecol MFM*. 2024;6(8):101406. Available at: <https://pubmed.ncbi.nlm.nih.gov/38866134>.
34. Soepnel LM, Norris SA, Schrier VJ, et al. The association between HIV, antiretroviral therapy, and gestational diabetes mellitus. *AIDS*. 2017;31(1):113-125. Available at: <https://pubmed.ncbi.nlm.nih.gov/27677165>.
35. Chebrolu P, Alexander M, Bhosale R, et al. The association of gestational diabetes with HIV infection and tuberculosis in Indian women. *Am J Trop Med Hyg*. 2022;107(3):569-572. Available at: <https://pubmed.ncbi.nlm.nih.gov/35914684>.
36. Bengtson AM, Madlala H, Matjila MJ, et al. Associations of HIV and antiretroviral therapy with gestational diabetes in South Africa. *AIDS*. 2023;37(13):2069-2079. Available at: <https://pubmed.ncbi.nlm.nih.gov/37534696>.
37. Hailu W, Tesfaye T, Tadesse A. Hyperglycemia after dolutegravir-based antiretroviral therapy. *Int Med Case Rep J*. 2021;14:503-507. Available at: <https://pubmed.ncbi.nlm.nih.gov/34349567>.
38. Hirigo AT, Gutema S, Eifa A, Ketema W. Experience of dolutegravir-based antiretroviral treatment and risks of diabetes mellitus. *SAGE Open Med Case Rep*. 2022;10:2050313X221079444. Available at: <https://pubmed.ncbi.nlm.nih.gov/35223037>.

39. Lamorde M, Atwiine M, Owarwo NC, et al. Dolutegravir-associated hyperglycaemia in patients with HIV. *Lancet HIV*. 2020;7(7):e461-e462. Available at: <https://pubmed.ncbi.nlm.nih.gov/32105626>.
40. Nolan NS, Adamson S, Reeds D, O'Halloran JA. Bictegravir-based antiretroviral therapy-associated accelerated hyperglycemia and diabetes mellitus. *Open Forum Infect Dis*. 2021;8(5):ofab077. Available at: <https://pubmed.ncbi.nlm.nih.gov/33981777>.
41. O'Halloran JA, Sahrmann J, Parra-Rodriguez L, et al. Integrase strand transfer inhibitors are associated with incident diabetes mellitus in people with human immunodeficiency virus. *Clin Infect Dis*. 2022. Available at: <https://pubmed.ncbi.nlm.nih.gov/35521785>.
42. American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 190 summary: gestational diabetes mellitus. *Obstet Gynecol*. 2018;131(2):406-408. Available at: <https://pubmed.ncbi.nlm.nih.gov/29370044>.