HBV Burden and Poor Vaccine-Induced Protection in Adolescents with HIV-1 in West and Central Africa

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BACKGROUND

Recent data about the prevalence of HBV infection in adolescents with HIV-1 (AHIV) living in West and Central Africa (WCA) remain scarce. The development of novel antiretroviral strategies without tenofovir reinforces the need to evaluate the HBV burden and the level of vaccine-induced HBV protection in this population.

This study sought to ascertain the burden of HIV/HBV co-infection and the HBV vaccine-induced immunization in AHIV receiving care in four WCA HBV-endemic countries (Benin, Cameroun, Ivory Coast, Senegal).

METHODS

Consenting AHIV aged 12-17 years and followed in eight pediatric centers from the EVA network were enrolled. Clinical and sociodemographic parameters were collected, plasma HIV-1 RNA was quantified and HBV-biomarkers were screened. Factors associated with HBV vaccine seroprotection were explored using a penalized logistic regression model.

	Benin (n=170)	Cameroon (n=190)	Ivory Coast (n=137)	Senegal (n=140)	Total (n=637)
Age (years) (median, IQR)	15 (14-17)	16 (14-17)	15 (14-17)	16 (14- 17)	16 (14-17)
Mode of HIV acquisition (n, %)					
Mother-to-child transmission	155 (91.2)	187 (98.4)	132(96.4)	131 (93.6)	605 (95.0)
Other/unknown	15 (8.8)	3 (1.6)	5 (3.6)	9 (6.4)	32 (5.0)
History of HBV infection in the mother (n, %)					
yes	3 (1.8)	2 (1.1)	1 (0.7)	2 (1.4)	8 (1.3)
no	94 (55.3)	156 (82.1)	41 (29.9)	6 (4.3)	297 (46.6)
unknown	73 (42.9)	32 (16.8)	95 (69.3)	132 (94.3)	332 (52.1)
History of HBV infection in another household member (n, %)					
yes	0 (0.0)	2 (1.1)	1 (0.7)	2 (1.4)	5 (0.8)
no	93 (54.7)	154 (81.1)	39 (28.5)	3 (2.1)	289 (45.4)
unknown	77 (45.3)	34 (17.9)	97 (70.8)	135 (96.4)	343 (53.8)
Number of injections of HBV vaccine received since birth (n, %)					
0 or unknown	**170 (100.0)**	**107 (56.4)**	**129 (94.2)**	**139 (99.3)**	**545 (85.6)**
1-2	0 (0.0)	1 (0.5)	1 (0.7)	0 (0.0)	2 (0.3)
3	0 (0.0)	82 (43.2)	7 (5.1)	1 (0.7)	90 (14.1)
Previous screening for HBV infection since birth (n, %)					
No/unknown	**83 (48.8)**	**187 (98.4)**	**77 (56.2)**	**27 (19.3)**	**374 (58.7)**
Yes	87 (51.2)	3 (1.6)	60 (43.8)	113 (80.7)	263 (41.3)
If yes, number of previous diagnosis of HBV infection	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Current antiviral treatment (n, %)					
including XTC **and** TDF	137 (80.6)	171 (90.0)	124 (90.5)	129 (92.1)	561 (88.1)
including XTC **without** TDF	33 (19.4)	19 (10.0)	13 (9.5)	11 (7.9)	76 (11.9)
including neither TDF or XTC	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 1. Clinical and sociodemographic characteristics of 637 adolescents

Rare (1.1%) but frequently undiagnosed active HBV coinfection.
Low rate of HBV vaccine-induced protection (13.9%).
HBV screening and vaccine-induced immunization should be improved in adolescents with HIV-1 living in West and Central Africa.

RESULTS

Overall, 27/637 AHIV were diagnosed with HBV coinfection (seroprevalence = 4.2% [95% CI: 2.8-6.1]), of whom 7 had active HBV infection (HBsAg+) (seroprevalence = 1.1% [95% CI: 0.4-2.2]).

Most HBV-uninfected AHIV (86,1%) had no or poor vaccine-induced immunization (anti-HBsAb <9 IU/L). Vaccine-induced HBV seroprotection (anti-HBsAb ≥10 IU/L) and strong seroprotection (anti-HBsAb ≥100 IU/L) was evidenced in 85 and 36 AHIV, respectively (13.9% and 5.9% of HBV-uninfected AHIV) (Table 2).

Table 2. Results of plasma HIV-1 RNA and HBV serologies

	Benin (n=170)	Cameroon (n=190)	Ivory Coast (n=137)	Senegal (n=140)	Total (n=637)
Current HIV plasma viral load (n, %)					
<50 cp/mL	117 (68.8)	134 (70.5)	92 (67.2)	111 (79.3)	454 (71.3)
50-199 cp/mL	23 (13.5)	20 (10.5)	17 (12.4)	7 (5.0)	67 (10.5)
200-999 cp/mL	11 (6.5)	15 (7.9)	10 (7.3)	4 (2.9)	40 (6.3)
≥1000 cp/mL	19 (11.2)	21 (11.1)	18 (13.1)	18 (12.9)	76 (11.9)
Current HBV serology (n, %)					
Active HBV infection (HBsAg+)	**2 (1.2)**	**0 (0.0)**	**4 (2.9)**	**1 (0.7)**	**7 (1.1)**
Past HBV infection	9 (5.3)	6 (3.2)	1 (0.7)	4 (2.9)	20 (3.1)
Absence of HBV infection	159 (93.5)	184 (96.8)	132 (96.4)	135 (96.4)	610 (95.8)
Level of anti-HBsAb in HBV-uninfected individuals (n, %)					
≤9 IU/L	129 (81.1)	173 (94.0)	100 (75.8)	123 (91.1)	525 (86.1)
10-99 IU/L	**18 (11.3)**	**0 (0.0)**	**21 (15.9)**	**10 (7.4)**	**49 (8.0)**
≥ 100 IU/L	**12 (7.5)**	**11 (6.0)**	**11 (8.3)**	**2 (1.5)**	**36 (5.9)**

Compared to what observed in Benin, rates of HBV seroprotection were lower in Cameroon (OR=0.30, 95%CI: 0.14-0.59) and Senegal (OR=0.44, 95%CI: 0.21-0.87) but higher in Ivory Coast (OR=1.36, 95%CI: 0.78, 2.38).

Vaccine-induced seroprotection was not associated with sex, age, concomitant unsuppressed HIV viremia (pVL ≥50 cp/mL) or a history of HBV infection in the mother or any other household member (Table 3).

	Univariable Model			Multivariable Model		
Variables	OR	95% CI	P-value	OR	95% CI	P-value
Country			**<0.001**			**<0.001**
Benin	-	-		-	-	
Cameroon	0.30	0.14, 0.60		0.30	0.14, 0.59	
Ivory Coast	1.41	0.81, 2.45		1.36	0.78, 2.38	
Senegal	0.45	0.22, 0.90		0.44	0.21, 0.87	
Sex			0.2			0.3
Girl	-	-		-	-	
Boy	1.35	0.85, 2.12		1.31	0.82, 2.11	
Age	0.92	0.80, 1.06	0.3	0.94	0.82, 1.09	0.4
History of HBV infection in the mother			0.4			
No	-	-				
Yes	0.37	0.02, 6.55				
History of HBV infection in another household member			0.4			
No	-	-				
Yes	2.17	0.34, 13.95				
Current HIV viral load ≥50 cp/mL			0.089			
No	-	-				
Yes	1.52	0.94, 2.45				
Severe ongoing pathology (chronic or acute)			>0.9			
No	-	-				
Yes	0.96	0.31, 3.04				
BMI-for-age			0.7			
Normal	-	-				
Thinness	1.14	0.62, 2.10				
Height-for-age			0.2			
Normal	-	-				
Stunting	1.45	0.85, 2.47				

Table 3. Univariable and Multivariable Firth's Penalized Logistic Regression of factor associated with vaccine-induced HBV seroprotection

CONCLUSIONS

Despite a low burden of HBV infection in a large cohort of AHIV living in WCA, our study highlights the urgent need to improve both HBV screening and HBV vaccine-induced immunization in this population.

This recommendation is particularly important in the perspective of future ARV strategies without tenofovir in order to prevent the risk of HBV reactivation in co-infected patients and to prevent the risk of acute HBV infections in non-immune adolescents living in HBV-endemic countries.

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