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Incidence of Recent Human Immunodeficiency Virus Infection at Two Voluntary Counseling Testing Centers in Pernambuco, Brazil, from 2006 to 2009

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This study shows HIV-1 incidence in the northeastern region of Brazil, where the HIV epidemic has spread recently. Incidence was higher among men (1.34%; 95% confidence interval [CI], 1.00% to 1.69%) than among women (0.55%; 95% CI, 0.43% to 0.68%) ($P < 0.0001$), and there was an association between younger age and recent HIV infection ($P < 0.004$).

The identification of recent infections through immunoassays provides important data for evaluating intervention policies, guiding prevention methods, and monitoring antiretroviral resistance in newly diagnosed individuals when performed in parallel with genotypic assays and may be useful in the selection of cohorts for vaccine and clinical trial follow-ups (3, 6, 8, 10, 13).

The introduction of an algorithm for serological testing and the use of a sensitive/less-sensitive (detuned) immunoassay that enables the identification of recent HIV-1 infection represents an important advance in this area (7). This approach is referred to as the serological testing algorithm for recent HIV seroconversion (STARHS), and the BED-capture enzyme immunoassay (BED-CEIA) is a currently used assay able to determine the incidence of HIV-1 (11).

The present study was conducted to determine the annual incidence of HIV-1 infection in two voluntary counseling testing (VCT) centers in the metropolitan region of Recife (Pernambuco), located in the northeastern region of Brazil, and to examine the association of epidemiological characteristics with duration of the infection (recent or long-term). For this purpose, the BED-CEIA test for HIV-1 incidence (Calypte Biomedical Corporation, Oregon) was performed in accordance with the manufacturer's instructions and as previously described (5, 11). Samples with a normalized optical density (ODn) of >1.2 were classified as long-term infections, and for those with an ODn of ≤1.2, the test was performed in triplicate. Samples were considered to be indicative of a recent infection if the median of the triplicate measurements of the ODn was ≤0.8 (9). Incidence calculation was performed as suggested by the U.S. Centers for Disease Control and Prevention (CDC) (2), and adjustment factors for the sensitivity and specificity of the test (9) were subsequently applied.

Between January 2006 and December 2009, 497 HIV-positive patients were diagnosed in two VCT centers (Cabo de Santo Agostinho and Paulista) in Pernambuco, and 375 aliquots from these patients (77%) were available for BED-CEIA testing, with the samples being obtained from the serum repositories of the VCT center of origin. Samples in which antiretroviral therapy (ART) had been previously used, vertical transmission was reported, or HIV was detected via serological testing more than 6 months prior to the collection of the sample were excluded. All patients whose samples were used in the study had been diagnosed with HIV infection in accordance with the Brazilian Ministry of Health guidelines. Each case was serologically confirmed by enzyme immunoassay, and immunofluorescence or Western blotting was performed as a confirmatory test with two independent serum samples.

Most of the individuals were women (52%) and had ≤8 years of schooling (65.1%). Regarding risk exposure, most patients were heterosexual (86.7%) and 27 patients (7.2%) reported having had sexual intercourse with HIV-positive partners. The median age was 29 years (range, 24 to 37 years), and a univariate analysis indicated an association between younger age and recent HIV infection in which individuals with recent and long-term infection had median ages of 27 years (range, 22 to 35 years) and 30 years (range, 24 to 37 years), respectively ($P < 0.004$).

The results obtained are shown in Table 1. One hundred five (28%) of 375 patients were classified as recent infections. No significant differences were observed with respect to fluctuations in the incidence and prevalence over the years of the study. The prevalence ranged from 1.22% to 1.50%, while the incidence ranged from 0.62% to 0.91%. The overall incidence was 0.73% per year (95% confidence interval [CI], 0.61% to 0.86%), and the overall prevalence was 1.31% (95% CI, 1.19% to 1.43%) per year. The overall sample analysis indicated that the incidence among men was significantly higher than that among women, at 1.34% per year (95% CI, 1.00% to 1.69%) for men and 0.55% (95% CI, 0.43% to 0.68%) for women ($P < 0.0001$). The prevalence was also higher among men, at 2.80% (95% CI, 2.45% to 3.15%) among men and 0.87% (95% CI, 0.77% to 0.97%) among women ($P < 0.0001$), a pattern that has also been observed in other studies (1, 12). The higher prevalence and incidence among men may be accounted for by the predominance of the epidemic among men despite the growing number of women with AIDS in Brazil (4). The incidence of recent infection among women may be underes-

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TABLE 1 Annual number of recent infections, prevalence, and incidence of HIV-1, as estimated using the BED-CEIA, from 2006 to 2009

Yr or sex	No. of individuals: Tested	HIV positive[a]	HIV negative	Prevalence (%) (95% CI)	*P* value	No. (%) of individuals with: BED-tested samples[b]	Recent infection[c]	Adjusted incidence (%) (95% CI)[d]	*P* value
2006	9,042	111	8,931	1.23 (1.00–1.46)	0.276	66 (61.1)	18 (27.3)	0.66 (0.42-0.90)	0.103
2007	9,383	141	9,242	1.50 (1.25–1.75)		98 (70.5)	29 (29.6)	0.91 (0.63-1.18)	
2008	9,330	122	9,208	1.31 (1.08–1.51)		118 (99.2)	34 (28.8)	0.75 (0.50-1.01)	
2009	10,121	123	9,998	1.22 (1.00–1.44)		93 (76.8)	24 (25.8)	0.62 (0.40-0.83)	
Male	8,692	243	8,449	2.80 (2.45–3.15)	<0.0001	180 (75)	44 (24.4)	1.34 (1.00-1.69)	<0.0001
Female	29,184	254	28,930	0.87 (0.77–0.97)		195 (78.9)	61 (31.3)	0.55 (0.43-0.68)	
Total	37,876	497	37,379	1.31 (1.19–1.43)		375 (77)	105 (28)	0.73 (0.6-0.86)	

[a] Represents the total number of individuals serologically diagnosed with HIV infection. A total of 10 HIV-positive patients were excluded from the incidence calculation: eight had had a previous positive serological test for HIV, one was a case of vertical transmission, and one was undergoing antiretroviral treatment. Three of these individuals were from the 2006 cohort, two were from the 2007 cohort, three were from the 2008 cohort, and two were from the 2009 cohort.

[b] Total number of available aliquots among the total number of HIV-positive samples eligible for BED-CEIA testing (excluding the 10 HIV-positive patients).

[c] Proportion of recent infections out of the total number of samples tested using BED-CEIA.

[d] Calculated in accordance with McDougal et al. (9). The results are expressed as the incidence/100 people/year (95% CI).

timated by the overrepresentation of pregnant women at the VCT centers or by the greater demand among women for health services in general.

The female patients from the Paulista VCT center were stratified as pregnant or nonpregnant. In the nonpregnant group, the respective prevalence and incidence were 1.44% (95% CI, 1.09% to 1.79%) and 0.44% (95% CI, 0.18% to 0.70%), whereas among the pregnant women, the prevalence and incidence were 0.36% (95% CI, 0.20% to 0.52%) and 0.18% (95% CI, 0.02% to 0.34%), respectively. The differences in the incidence and prevalence between pregnant women and other VCT volunteers indicate that these populations have distinct epidemiological characteristics with respect to risk of exposure. A lower incidence and prevalence among pregnant women may be expected because HIV testing is compulsory for all pregnant women in Brazil.

Major variations in the incidence were observed for males, with a significant increase ($P = 0.0034$) from 0.83% (95% CI, 0.32% to 1.34%) in 2008 to 1.78% (95% CI, 1.01% to 2.55%) in 2009. For females, the incidence rates significantly decreased ($P = 0.000021$) from 0.75% (95% CI, 0.46% to 1.04%) in 2007 to 0.25% (95% CI, 0.10% to 0.39%) in 2009.

The present study is the first to determine HIV-1 incidence using STARHS in the northeastern region of Brazil, where the HIV epidemic has spread recently, although it is exhibiting a decline in the southeastern and central-western regions of the country (4). A higher estimated incidence was observed among men, and younger individuals had a higher rate of recent HIV infection, which indicates that this demographic category requires a greater focus on prevention measures, such as greater access to serological testing and the use of more specifically targeted strategies. Furthermore, the HIV epidemic trends should be continuously monitored over time in specific groups that potentially have an increasing incidence.

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