
CLINICAL SCIENCE

DELAY IN INTRODUCING ANTIRETROVIRAL THERAPY IN PATIENTS INFECTED BY HIV IN BRAZIL, 2003-2006**Paulo Roberto Borges Souza-Jr¹, Celia Landmann Szwarcwald¹, Euclides Ayres Castilho²**

Souza-Jr, PRB, Szwarcwald CL, Castilho EA. Delay in introducing antiretroviral therapy in patients infected by HIV in Brazil, 2003-2006. Clinics. 2007; 62(5):579-84.

PURPOSE: To characterize the population of HIV+ Brazilian patients with late introduction of antiretroviral therapy (ARVT), using information from the Laboratory Exam Control System.

METHODS: The study analyzed 84,694 patients, representing all individuals in Brazil age 15 or over with an initial CD4⁺ T lymphocyte count requested between 2003 and 2006, and whose ARVT start date was later than their initial CD4⁺ T cell count. These patients were considered antiretroviral treatment naive. The initial CD4⁺ T cell distribution was analyzed according to sex, age, region and year.

RESULTS: Most of the patients were between 15 and 49 years of age (91%); 56% were males; 76% were asymptomatic; 50% lived in the Southeastern region of the country, with an additional 20% in the South. Initial CD4⁺ counts for one-third of the patients were less than 200 cells/mm³. When combined with the number of symptomatic individuals, 41% of the total group was in need of immediate ARVT. This group included 47% of the men and 53% of the patients aged 50 years and over.

CONCLUSIONS: Despite universal access to ARVT in Brazil, results show that a high proportion of patients initiate ARVT at an advanced stage of disease, indicating the need to develop strategies to promote early diagnosis of HIV infection nationwide.

KEY-WORDS: CD4⁺ T lymphocytes. HIV. AIDS. Antiretroviral therapy. Brazil.

INTRODUCTION

The quality of life of people living with HIV/AIDS has improved drastically with the introduction of highly active antiretroviral therapy (HAART), resulting in a significant reduction of viral load and an increase of the CD4⁺ T lymphocyte count among treatment-naive patients¹.

However, access to HAART is uneven, and varies depending on public policies and treatment costs in each country. In Latin America, according to information from national AIDS programs, ARVT coverage varies from 15%

in Peru to 100% in Argentina, Brazil and other countries².

In Brazil, the Ministry of Health began distributing drugs for prophylaxis and treatment of opportunistic infections in the mid-1980s. AZT (zidovudine) was the first drug available in Brazil, beginning in 1991. The combined effort of patients, civil society groups, and government agencies resulted in the passage of a federal law in 1996 guaranteeing the right of all individuals with HIV/AIDS to receive the drugs necessary for their treatment free of charge³.

The high cost of antiretroviral therapies and the growing number of patients in need of them have been a continuing challenge for the Ministry of Health. Brazil has adopted several strategies to reduce the cost of ARVT, including local production of drugs and negotiations with international pharmaceutical companies to provide drugs at lower cost. As a result, the government has been able to

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maintain its commitment despite the increased number of patients under treatment and the increased proportion of them who require more expensive and complex treatment schemes.⁴ Universal distribution of ARV drugs has resulted in an improved quality of life for patients, as well as increased survival and a significant reduction in hospitalizations.^{5,6,7}

The public health system provides all necessary laboratory tests for HIV diagnosis and patient follow-up.⁸ In recent years, public health policies have been implemented to encourage periodic HIV testing amongst the general population. For example, HIV testing has become a routine part of prenatal care.

However, data from the 2004 Brazilian Knowledge, Attitudes and Practices Survey show that only 28% of individuals have been tested even once for HIV.⁹ Thus, despite the undisputed impact of universal ARVT, many individuals potentially in need of ARVT delay the initiation of treatment or have inadequate follow-up and adherence.

The Laboratory Exam Control System (SISCEL) was created in Brazil with the aim of monitoring laboratory procedures associated with CD4⁺/CD8⁺ T lymphocyte counts and viral load quantification. These exams are performed to determine the need for treatment and to monitor the disease evolution of patients receiving ARVT. This article is based on SISCEL data, and addresses the problem of late initiation of therapy in Brazil.

MATERIALS AND METHODS

SISCEL is made up of three sub-systems, one of which includes patient information, while the other two include information on laboratory test results for viral load and the CD4⁺ T lymphocyte count. The sub-systems are linked by a patient identification code, and are fed by two public health laboratory networks implemented in 1997 (one for CD4⁺/CD8⁺ T cell count exams and the other for viral load exams). Currently, these networks include 88 laboratories for T cell counts and 72 for viral load quantification, located in every state in the nation.

For the present study, SISCEL data from 2003-2006 was requested by the National STD/AIDS Program (PN-DST/AIDS). Occasionally, duplicates occur in the register, in which the same patient appears in the system with different codes. The National Program uses a method to detect these duplicates so that each patient is counted only once. This method involves establishing a "key field" and using the *Reclink* application to search for phonetic key patterns. The "key-field" is composed of the concatenation of the first and last names, birth date, sex and the code of the state of residence. This paper analyzed the SISCEL database

without duplicates and without patient identity, so patient consent was not required.

The following SISCEL variables were analyzed: initial CD4⁺ T lymphocyte counts, age, sex, infection status (symptomatic, asymptomatic), reason for the exam (evaluation of treatment indication, ARVT monitoring, therapeutic scheme change), date of exam request and date of ARVT initiation.

The study sought to assess the patients' immunologic status at the date of the first CD4⁺ T lymphocyte count. All individuals aged 15 years and over with an initial CD4⁺ T lymphocyte count between 2003 and 2006, and for whom the initial therapy start date was later than the CD4⁺ T cell exam request were included in the analysis. These patients were considered ARVT naïve, and the date of the exam request was considered the first evaluation for initiating therapy. Among ARVT naïve patients, the distribution of initial CD4⁺ T lymphocyte counts was analyzed.

In order to obtain the proportion of patients with delayed initiation of ARVT, CD4⁺ T lymphocyte counts were classified into three categories: in need of therapy (< 200 CD4⁺ T cells/mm³); under observation (200- 349 CD4⁺ T cells/mm³); and no indication for therapy (≥ 350 CD4⁺ T cells/mm³), according to the Ministry of Health's "Anti Retroviral Therapy Recommendations for Adults and Adolescents Infected by HIV"¹¹.

Patients included in the study were characterized by sex; age (15-49 years of age and 50 years and over); presence or absence of symptoms; and macro-region of residence (North, Northeast, Southeast, South, or Central-West).

Finally, the proportion of treatment-naïve patients that fit the criteria for immediate initiation of treatment was established by adding the number of patients with CD4⁺ T lymphocyte counts < 200 cell/mm³ to the number of symptomatic patients with CD4⁺ T counts ≥ 200 cell/mm³.

RESULTS

Between 2003 and 2006, 84,694 patients had their first CD4⁺ T lymphocyte count for evaluation of ARVT indication. Of these, 16,659 had their first exam in 2003; 20,285 in 2004; 24,249 in 2005 and 23,501 in 2006. Most of the patients were between 15 and 49 years old (91%), and 56% were males. Seventy-six percent were asymptomatic. Fifty percent lived in the Southeast, 20% in the South, 18% in the Northeast, 7% in the Central-West region and 5% in the North (Table 1).

The median initial CD4⁺ T lymphocyte count was 326 cells/mm³ (290 cells/mm³ for men vs. 368 cells/mm³ for women), that is, more than 50% of the patients were in a disease stage in which ARVT initiation would be recom-

Table 1 - Distribution of treatment-naïve patients by sex, age, presence of symptoms, region of residence and year of exam request. Brazil, 2003-2006.

Characteristics	N	%
Sex		
Female	37541	44.4
Male	47059	55.6
Age group (in years)		
15-49	76940	90.8
50 and over	7756	9.2
Presence of symptoms		
Asymptomatic	62143	76.1
Symptomatic	19559	23.9
Region		
North	4360	5.4
Northeast	14309	17.9
Southeast	39792	49.7
South	16034	20.0
Central-West	5644	7.0

mended depending on viral load and the presence of symptoms.

Table 2 shows the proportion of patients that had CD4⁺ counts less than 200 cells/mm³ by sex, age, region of residence, year and presence of symptoms. This proportion is greater among men (38%) than among women (27%). Patients over 50 years old presented the most critical situation (44%) when compared to the younger individuals (32%). There was significant regional variation as well. The

Table 2 - Distribution (%) of CD4⁺ T lymphocyte counts among treatment-naïve patients by sex, age group, presence of symptoms, region of residence and year of exam request. Brazil, 2003-2006.

Patient characteristics	CD4 ⁺ T lymphocyte count (cell/mm ³)		
	< 200	Between 200 and 350	> 350
Sex			
Female	26.6	20.8	52.6
Male	37.8	20.4	41.9
Age group (in years)			
15-49	31.7	20.4	47.9
50 and over	43.7	21.7	34.6
Presence of symptoms			
Asymptomatic	22.7	22.2	55.1
Symptomatic	65.1	15.2	19.6
Region			
North	40.5	22.3	37.2
Northeast	36.5	20.0	43.5
Southeast	31.5	20.1	48.4
South	28.0	22.3	49.7
Central-West	38.0	19.7	42.3
Year of exam request			
2003	32.9	21.5	45.6
2004	31.8	20.7	47.5
2005	32.1	20.4	47.5
2006	34.3	19.9	45.8
Total	32.8	20.5	46.7

North, although with fewer patients, possessed the greatest proportion of late initiators (40%). The Central-West region (38%) and the Northeast (36%) also presented values higher than the national average (33%). There was little variation (32%-34%) from year to year. As for opportunistic infections among symptomatic patients, only 20% had CD4⁺ counts greater than 350 cells/mm³. As expected, more of the asymptomatic patients had higher T cell counts (55%).

Table 3 shows the estimated proportion of patients with an indication for immediate treatment (CD4⁺ count less than 200 cells/mm³ or symptomatic). This group comprised 41% of all patients, 47% of the men and 53% of those over 50 years of age. By geographic region, the lowest value was 35% in the South, reaching as high as 50% in the North.

Table 3 - Proportion of ARVT naïve patients that fit the criteria for immediate initiation of ARVT (< 200 CD4⁺ T cells/mm³ or symptomatic) according to sex, age group, region of residence and year of exam request. Brazil, 2003-2006.

Patient characteristics	Recommendation for ARVT initiation (%)	
	YES	NO
Sex		
Female	33.4	66.6
Male	46.8	53.2
Age Group		
15-49 years	39.6	60.4
≥ 50 years	52.9	47.1
Region		
North	50.0	50.0
Northeast	46.5	53.5
Southeast	39.1	60.9
South	34.9	65.1
Central-West	45.0	55.0
Year of exam request		
2003	41.2	58.8
2004	39.8	60.2
2005	39.9	60.1
2006	42.4	57.6
Total	40.8	59.2

DISCUSSION

Without treatment, HIV-infected patients take an average of 8 years to reach an advanced stage of disease, when CD4⁺ counts fall to values less than 200 cells/mm³ and opportunistic diseases begin to develop.¹ It is during this symptomatic phase that individuals who do not know their serological status typically seek medical assistance.

Unknown serostatus is the principal factor associated with the late arrival of HIV-infected individuals to the health system. This not only favors the spread of the vi-

rus, but also makes these patients more difficult to treat, since patients that begin treatment with low CD4⁺ T cell counts (especially below 50 cells/mm³) typically have a poorer response to antiretroviral therapy.^{12,13,14}

Several studies have addressed the problems associated to¹⁵ and the need for an early diagnosis of HIV infection. The proportion of patients with delayed initiation of ARVT varies widely according to region, but is generally significant¹⁶. In the United States, Klein et al. (1998) analyzed data regarding HIV-infected patients from an integrated health care system. Among them, 62% presented CD4⁺ T counts lower than 350 cells/mm³,³ and 43% were less than 200 cells/mm³. Another survey carried out in South Carolina (USA) between 2000 and 2003 showed that 50% of treatment-naïve patients presented CD4⁺ T cell counts lower than 200 cells/mm³.¹⁸ Studies in Italy¹⁹ and in French Guiana²⁰ presented values greater than 30%.

In the case of Brazil, information on initial CD4⁺ T cell counts is available at the national level through SISCEL, forming the basis of the present analysis. The system is representative of the exams conducted by the public health system in the five regions because the CD4⁺ T cell count is considered a high complexity exam which must be registered in order for the laboratory to be reimbursed by the Brazilian health system. Although the system is limited to the network of public laboratories, it is believed to cover most HIV-infected patients, since only approximately 24% of the Brazilian population is estimated to have a private health plan,²¹ and several health plans do not cover this type of exam.

One limitation of our study is that we assumed the CD4⁺ T cell count request date to be the first evaluation for the indication of therapy initiation, but in a few cases, the first exam could have been performed by a private lab or a lab outside of the public network.

Of all the patients analyzed in this study, the National STD/AIDS Program found that about 2% of cases were duplicates. These are patients that were tested in different laboratories and received different identification codes. The previously described method of screening for duplicates was proposed by the National Program and has been routinely adopted for all databases of the program²². Had these duplicates not been screened out, this would represent a potential bias, since a number of second exams would have been counted as first ones.

The SISCEL data analyzed for the period between 2003 and 2006 showed that around one-third of the HIV-infected individuals had a CD4⁺ T lymphocyte count of less than 200 cells/mm³ at initial presentation. When combined with symptomatic individuals, these findings indicate that 41% were in need of immediate treatment at presentation. These

results were unexpected, because Brazil is a country where HIV testing, CD4⁺ monitoring, and antiretroviral treatment are offered to the population free of charge.

Another possible analysis based on the SISCEL data is to consider the time between the first CD4⁺ T lymphocyte count and the initiation of therapy. This paper considered the analysis of patients' immunologic status at the date of the first CD4⁺ T lymphocyte count because the main cause of delayed ARVT initiation is the late diagnosis, rather than access to therapy.

Like Brazil, England has a surveillance system of CD4⁺ T lymphocyte count exams. According to Gupta et al.²³, the system covers 88% of all exams performed in England and Wales. The authors analyzed patients that had their first CD4⁺ T lymphocyte count within a period of 6 months after initial HIV diagnosis (considered treatment naïve), and found that about 37% of the patients had CD4⁺ T counts lower than 200 cells/mm³ between 1990 and 1998. In 2003, differences were found by analyzing the same information system by risk category: among men that have sex with other men, the proportion was much lower (21%) than among heterosexuals (40%).²⁴

For countries that do not have registries of initial CD4⁺ T lymphocyte counts, other criteria have been adopted to estimate the delay in initiating therapy, such as the time between HIV notification and AIDS diagnosis. A short span, in general less than two months, would indicate a late detection of HIV infection. In Spanish studies of AIDS cases diagnosed between 1994 and 2000, 28% of patients discovered that they were seropositive within 2 months of AIDS diagnosis.²⁵

Literature on the topic emphasizes several factors that may be associated with delay in initiating therapy, among them, risk category (especially heterosexuals), age (especially older adults), sex (males, since women are often tested during pregnancy), as well as other cultural, political, and economic factors.^{17,19,26}

In Brazil, women of reproductive age are routinely screened for HIV during pregnancy, as recommended by the Ministry of Health. Detection of HIV infection during prenatal care also promotes the early detection of infected partners, generally in the under-50 age group. The present findings corroborate Ministry of Health recommendations, as the over-50 age group showed a higher proportion of delayed initiation of therapy when compared to the population group aged 15-49 years.

As for geographic regional analysis, obeying the same logic of inequality of resources and distribution of health services found in other Brazilian studies,²⁷ the South and Southeast presented the smallest proportions of patients with late initiation of ARVT.

The differences by sex and region are associated with coverage of HIV-testing in those population groups. Data from the 2004 Brazilian Knowledge, Attitudes and Practices Survey showed 24% lifetime HIV testing in men and 35% among women. Coverage of HIV testing also differs between Brazilian regions, ranging from 15% in the Northeast to 35% in the Southeast.⁹

Current testing technology makes it possible to discover HIV serostatus within minutes, with high sensitivity and specificity.^{28,29} In order to reduce the spread of disease and increase patient survival, it is necessary to promote HIV testing, especially among those individuals that do not feel

they are at risk. Patients that begin ARVT late reduce the possibility of therapeutic success, consume more resources, and present lower survival rates.

The CD4⁺ T lymphocyte count surveillance system allows for the monitoring of the proportion of HIV infected individuals with late initiation of ARVT. The results of this study show that the proportion of patients that start therapy in an advanced stage of the disease is still high, indicating the need to develop more effective strategies to promote early diagnosis of HIV infection nationwide in order to increase the impact of universal access to ARVT.

RESUMO

Souza-Jr, PRB, Szwarcwald CL, Castilho EA. Atraso na introdução de terapia antiretroviral em pacientes infectados pelo HIV no Brasil, 2003-2006. Clinics. 2007;62(5):579-84.

OBJETIVO: Caracterizar a população de indivíduos infectados pelo HIV que inicia tardiamente a terapia com anti-retrovirais (TARV) no Brasil, utilizando informações do Sistema de Controle de Exames Laboratoriais.

MÉTODOS: Foram analisados todos os indivíduos de 15 anos ou mais de idade que realizaram exame inicial para contagem de linfócitos T CD4⁺ para avaliação de indicação de tratamento entre os anos de 2003 e 2006, cuja data de início da terapia foi posterior ou igual à data de solicitação da contagem de células T CD4⁺ (84694 pacientes). Esses pacientes foram considerados como virgens de tratamento com anti-retrovirais. A distribuição da contagem inicial de linfócitos T CD4⁺ foi analisada por sexo, idade, Grande Região e ano de realização do exame.

RESULTADOS: A maioria dos pacientes tinha entre 15 e 49 anos de idade (91%); 56% eram do sexo masculino; 76% assintomáticos; 50% residiam na Região Sudeste e 20% na Região Sul. A proporção de indivíduos cujo resultado do primeiro exame para contagem de linfócitos TCD4⁺ era inferior a 200 cel/mm³ foi de 33%. Somando-se a esses os indivíduos sintomáticos, o valor atinge 41% para a totalidade; 47% para os homens e 53% para os pacientes com mais de 50 anos de idade.

CONCLUSÕES: Em que pese o acesso universal à TARV, no Brasil, os resultados mostram que uma alta proporção de pacientes inicia o tratamento em um estágio avançado da doença, apontando para a necessidade do estabelecimento de estratégias de diagnóstico precoce da infecção pelo HIV.

UNITERMOS: Linfócitos T CD4⁺. HIV. Aids. Terapia anti-retroviral. Brasil

REFERENCES

1. Bartlett JG, Gallant JE. Tratamento Clínico da infecção pelo HIV. Edição traduzida 2001-2002. Baltimore, Maryland: Johns Hopkins University; 2002.
2. Chequer P, Cuchi P, Mazin R, Garcia Calleja JM. Access to antiretroviral treatment in Latin American countries and the Caribbean. AIDS. 2002;16(Suppl 3):S50-7.
3. Bastos FI, Kerrigan D, Malta M, Carneiro-da-Cunha C, Strathdee SA. Treatment for HIV/AIDS in Brazil: Strengths, challenges, and opportunities for operations research. AIDS. 2001;15(1):1-15.
4. Teixeira PR, Vitória MA, Barcarolo J. Antiretroviral treatment in resource-poor settings: the Brazilian experience. AIDS. 2004;18(suppl 3):S5-S7.
5. Levi GC, Vitória MA. Fighting against AIDS: the Brazilian experience. AIDS. 2002;16:2373-2383.
6. Matida LH, Marcopito LF. Aumento do tempo de sobrevivência das crianças com aids – AIDS - Boletim Epidemiológico, Ano XV nº2. 2002.
7. Marins JR, Jamal LF, Chen SY, Barros MB, Hudes ES, Barbosa AA, et al. Dramatic improvement in survival among adult Brazilian AIDS patients. AIDS. 2003;17:1675-82.
8. Brasil. Ministério da Saúde. Secretaria de Políticas de Saúde. Diretrizes dos Centros de Testagem e Aconselhamento – CTA: manual. Coordenação Nacional de DST e AIDS. Brasília: Ministério da Saúde, 1999. 32 p.

9. Brasil. Ministério da Saúde. Secretaria de Vigilância de Saúde. Programa Nacional de DST e AIDS. Pesquisa de conhecimento Atitudes e Práticas na População Brasileira de 15 a 54 anos, 2004. Brasília: Ministério da Saúde; 2006. 175p.
10. Camargo-Jr KR, Coeli CM. Reclink: an application for database linkage implementing the probabilistic record linkage method. *Cadernos de Saúde Pública*. 2000;16:439-447.
11. Brasil. Ministério da Saúde. Secretaria de Vigilância Sanitária. Recomendações para Terapia Anti-Retroviral em Adultos e Adolescentes Infectados pelo HIV – 2006 (versão preliminar). Brasília: Ministério da Saúde, 2006. 85 p.
12. Severe P, Leger P, Charles M, Noel F, Bonhomme G, Bois G, et al. Antiretroviral therapy in a thousand patients with AIDS in Haiti. *N Engl J Med*. 2005;353:2325-34.
13. Egger M, May M, Chene G, Phillips AN, Ledergerber B, Dabis F, et al. Prognosis of HIV-1-infected patients starting highly active antiretroviral therapy: a collaborative analysis of prospective studies. *Lancet*. 2002;360:119-29.
14. Egger M and the Antiretroviral Therapy (ART) Cohort Collaboration. Prognostic importance of initial response in HIV-1 infected patients starting antiretroviral therapy: analysis of prospective studies. *Lancet*. 2003;362:679-686.
15. Szwarcwald CL, Carvalho MF, Barbosa-Júnior A, Barreira D, Speranza FAB, Castilho EA. Temporal trends of HIV-related risk behavior among Brazilian Military Conscripts, 1997-2002. *Clinics*. 2005;60:367-374.
16. Dybul M, Bolan R, Condoluci D, Cox-Iyamu R, Redfield R, Hallahan CW, et al. Evaluation of initial CD4+ T cell counts in individuals with newly diagnosed human immunodeficiency virus infection, by sex and race, in urban settings. *J Infect Dis*. 2002;185:1818-21.
17. Klein D, Hurley LB, Merrill D, Quesenberry CP Jr; Consortium for HIV/AIDS Interregional Research. Review of medical encounters in the 5 years before a diagnosis of HIV-1 infection: implications for early detection. *J Acquir Immune Defic Syndr*. 2003;32:143-52.
18. Gay CL, Napravnik S, Eron JJ Jr. Advanced immunosuppression at entry to HIV care in the southeastern United States and associated risk factors. *AIDS*. 2006;20:775-8.
19. Girardi E, Aloisi MS, Arici C, Pezzotti P, Serraino D, Balzano R, et al. Delayed presentation and late testing for HIV: demographic and behavioral risk factors in a multicenter study in Italy. *J Acquir Immune Defic Syndr*. 2004;36:951-9.
20. Nacher M, El Guedj M, Vaz T, Nasser V, Randrianjohany A, Alvarez F, et al. Risk factors for late HIV diagnosis in French Guiana. *AIDS*. 2005;19:727-9
21. Viacava F, Souza-Junior PR, Szwarcwald CL. Coverage of the Brazilian population 18 years and older by private health plans: an analysis of data from the World Health Survey. *Cad Saude Publica*. 2005;21(Suppl):119-28.
22. Lucena FF, Fonseca MG, Sousa AI, Coeli CM. O relacionamento de bancos de dados na implementação da vigilância da aids: Relacionamento de dados e vigilância da aids. *Cadernos de Saúde Coletiva*. 2006; 14:305-312.
23. Gupta SB, Gilbert RL, Brady AR, Livingstone SJ, Evans BG. CD4 cell counts in adults with newly diagnosed HIV infection: results of surveillance in England and Wales, 1990-1998. CD4 Surveillance Scheme Advisory Group. *AIDS*. 2000;14:853-61.
24. Brown AE, Tomkins SE, Logan LE, Lamontagne DS, Munro HL, Hope VD, et al. Monitoring the effectiveness of HIV and STI prevention initiatives in England, Wales, and Northern Ireland: where are we now? *Sex Transm Infect*. 2006;82:4-10.
25. Castilla J, Sobrino P, De La Fuente L, Noguer I, Guerra L, Parras F. Late diagnosis of HIV infection in the era of highly active antiretroviral therapy: consequences for AIDS incidence. *AIDS*. 2002;16:1945-51.
26. Easterbrook PJ, Yu LM, Goetghebuer E, Boag F, McLean K, Gazzard B. Ten-year trends in CD4 cell counts at HIV and AIDS diagnosis in a London HIV clinic. *AIDS*. 2000;14:561-71.
27. Souza Júnior, PRB; Szwarcwald, CL, Castilho, EA. HIV infection during pregnancy: the Sentinel Surveillance Project, Brazil, 2002. *Revista de Saúde Pública*. 2004;38:764-772.
28. Duarte G, Gonçalves CV, Marcolin AC, Paschiani MC, Quintana SM, Mussi-Pinhata MM. Teste Rápido para detecção pelo HIV-1 em gestantes. *Revista Brasileira de Ginecologia e Obstetrícia*. 2001;23:107-111.
29. Carvalho RL, Krahe C, Farina G, Paula DO, Richetti N, Crossetti T. Teste Rápido para diagnóstico da infecção pelo HIV em parturientes. *Revista Brasileira de Ginecologia e Obstetrícia*. 2004;26:325-328.