



ORIGINAL


Epidemiological characterization of HIV/AIDS in adolescents who live in a municipality from southern Brazil

Caracterização epidemiológica do HIV/AIDS em adolescentes em um município no Sul do Brasil  
Caracterización epidemiológica del VIH/SIDA en adolescentes que viven en un municipio del Sur de Brasil


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ABSTRACT

**Objective:** To characterize the epidemiological profile of HIV/AIDS cases in adolescents. **Method:** A cross-sectional study, conducted from 2007 to 2019 with adolescents living in a municipality from southern Brazil, resorting to secondary data from the National System of Information about Notifiable Diseases. The demographic variables, that is, transmission characteristics, opportunistic infections and case evolution, were verified through descriptive analysis and frequency measures. **Results:** A total of 84 cases were reported, with predominance of the age group between 17 and 19 years old (92.8%), complete/incomplete high school (50.0%), male gender (73.8%), and white race (69.0%). Regarding HIV exposure, 75.0% were men with declared homoaffective relationships. Incidence by quadrennium periods was as follows: 14 cases, 26 cases and 41 cases, with 3 cases in 2019. The mortality rate was 0.35/100,000 inhabitants. Of the diagnoses, 67.9% were confirmed by rapid test and 39.3% by laboratory tests. 42.9% had AIDS at diagnosis. The most prevalent clinical signs were cachexia (10.7%), asthenia (8.3%) and persistent cough (7.1%). The most frequent opportunistic infections were oral candidiasis (6.7%), lymphadenopathy (4.4%) and changes in the central nervous system (4.4%). **Conclusion:** The adolescents' vulnerability and the need to intensify public policies for prevention and early diagnosis in this age group are evidenced.

Descriptors: HIV Infections. Acquired Immunodeficiency Syndrome. Adolescent. Cross-Sectional Studies. Epidemiological Studies.

RESUMO

**Objetivo:** Caracterizar o perfil epidemiológico dos casos de HIV/AIDS em adolescentes. **Métodos:** Estudo transversal, realizado com dados secundários do Sistema Nacional de Informação de Agravos de Notificação, de 2007 a 2019, de adolescentes residentes em um município no Sul do Brasil. Verificou-se por meio de análise descritiva e medidas de frequência variáveis demográficas, características de transmissão, infecções oportunistas e evolução dos casos. **Resultados:** Foram notificados 84 casos, com predomínio de idade entre 17 a 19 anos (92,8%); ensino médio completo/incompleto (50,0%); sexo masculino (73,8%) e raça branca (69,0%). Quanto à exposição ao HIV, 75,0% eram homens com relações homoafetivas declaradas. A incidência, por quadriênios, foi a seguinte: 14 casos, 26 casos e 41 casos, e em 2019, 3 casos. O coeficiente de mortalidade foi de 0,35/100.000 habitantes. Dos diagnósticos, 67,9% foram confirmados por teste rápido e 39,3% por exames laboratoriais. No momento do diagnóstico, 42,9% apresentavam AIDS. Os sinais clínicos de maior prevalência foram caquexia (10,7%), astenia (8,3%) e tosse persistente (7,1%). As infecções oportunistas mais presentes foram candidíase oral (6,7%), linfadenopatia (4,4%) e alterações no sistema nervoso central (4,4%). **Conclusão:** Evidencia-se a vulnerabilidade dos adolescentes e necessidade de intensificar políticas públicas para prevenção e diagnóstico precoce nessa faixa etária.

Descritores: Infecções por HIV. Síndrome de Imunodeficiência Adquirida. Adolescente. Estudos Transversais. Estudos Epidemiológicos.

RESUMÉN

**Objetivo:** Caracterizar el perfil epidemiológico de los casos de VIH/SIDA en adolescentes. **Métodos:** Estudio transversal realizado entre 2007 y 2019 con adolescentes que viven en un municipio del sur de Brasil, recurriendo a datos secundarios del Sistema Nacional de Información de Problemas de Salud Pasibles de Notificación. Por medio de análisis descriptivo y medidas de frecuencia se verificaron variables demográficas, características de transmisión, infecciones oportunistas y evolución de los casos. **Resultados:** Se notificaron 84 casos, con predominio del grupo etario de 17 a 19 años (92,8%), enseñanza media completa (50,0%), sexo masculino (73,8%) y raza blanca (69,0%). En relación con la exposición al VIH, 75,0% eran hombres con relaciones homoafectivas declaradas. En cada período de cuatro años, los valores de incidencia fueron los siguientes: 14 casos, 26 casos y 41 casos, con 3 casos en 2019. El índice de mortalidad fue 0,35/100.000 habitantes. Entre los diagnósticos, el 67,9% fue confirmado por test rápido y el 39,3% por medio de pruebas de laboratorio. Al momento del diagnóstico, el 42,9% tenía SIDA. Los indicios clínicos más prevalentes fueron caquexia (10,7%), astenia (8,3%) y tos persistente (7,1%). Las infecciones oportunistas más prevalentes fueron candidiasis oral (6,7%), linfadenopatía (4,4%) y alteraciones en el Sistema Nervioso Central (4,4%). **Conclusión:** El estudio pone en evidencia la vulnerabilidad de los adolescentes y la necesidad de intensificar políticas públicas para la prevención y el diagnóstico temprano en este grupo etario.

Descriptor: Infecciones por VIH. Síndrome de Inmunodeficiencia Adquirida. Adolescente. Estudios Transversales. Estudios Epidemiológicos.

## INTRODUCTION

Acquired Human Immunodeficiency Syndrome (AIDS) is caused by the Human Immunodeficiency Virus (HIV), a retrovirus that promotes weakness in the human immune system and weakening of its host.<sup>(1,2)</sup>

The natural course of HIV infection is initiated with the acute phase, characterized by nonspecific symptoms such as sore throat and fever. Subsequently, the chronic phase develops, in which the patients can manifest persistent lymphadenopathy or opportunistic infections (OIs) of lesser severity, such as candidiasis or Herpes-Zoster. Finally, after a few years, there is the “crisis phase”, in which the individual can develop severe OIs and secondary neoplasms, such as Kaposi's sarcoma.<sup>(3)</sup> These are defining conditions for AIDS, generated by immunosuppression, where the T-CD4+ lymphocyte count appears depressed, below 350 cells/mm<sup>3</sup>.<sup>(1,3-5)</sup>

Since the discovery of AIDS in the 1980s, it is still considered a pandemic.<sup>(6)</sup> Worldwide, in 2018, it was estimated that there were 37.9 million People Living with HIV (PLHIV), of which 1.7 million were new cases.<sup>(7)</sup> In Brazil, the incidence rate per 100,000 inhabitants/year decreased from 21.03 in 2008 to 17.81 in 2018. Among the cases reported in the age group from 15 to 19 years old, female adolescents had the same detection decline pattern, in contrast to the increased incidence among male adolescents. It is noteworthy that, in 2018, the Southern region presented the second highest rate of disease detection in Brazil and that the municipality under study is a reference for diagnosis and treatment in the region.<sup>(8)</sup> In this sense, with a focus on elucidating the epidemiological profile and sizing the extent of PLHIV/AIDS, notification of HIV cases became compulsory, in all age groups, through Ordinance 1,271 of 06/06/2014 and Normative Instruction dated 06/13/2014, of the Brazilian Ministry of Health (*Ministério da Saúde*, MS). Before that, only individuals with virus-related immunodeficiency disease, AIDS, were reported, using criteria related to LT-CD4+ count and development of OIs.<sup>(9,10)</sup>

Attentive to this demand, since 1985, the Ministry of Health has implemented the National Program of Sexually Transmitted Diseases (*Programa Nacional de Doenças Sexualmente Transmissíveis*, PNDST/AIDS), aiming to provide comprehensive care to people affected by these infections, as well as to promote health promotion actions aimed at reducing the incidence of such diseases.<sup>(11)</sup>

In the last decade, the literature has documented behaviors of people that can lead to direct HIV acquisition or transmission, with sexual contact being the greatest exposure.<sup>(3)</sup> From the adolescents' point of view, regarding the perception of the risks of acquiring a Sexually Transmitted Infection (STI) such as HIV, a differentiated approach is required in relation to the adult's perspective, as this age group has its own knowledge about sexuality linked to their habits and behaviors.<sup>(12)</sup> This is considered a high vulnerability group, due to the early risk behaviors and stigma related to this pathology.<sup>(13,14)</sup>

Given the data presented and the impact of the prevalence of HIV infections, especially in adolescents, it becomes necessary and important to carry out this study that aims at determining the incidence of adolescents exposed to the virus in this municipality from southern Brazil, as well as their clinical evolution and complications. Gaps are perceived in what is recommended by the health policies and the assistance provided to PLHIV/AIDS, as well as low resoluteness regarding prevention strategies, given the significant number of sexual infections, especially in adolescents.<sup>(15)</sup>

Therefore, this study is justified by the importance of knowing the epidemiological profile and clinical situation of PLHIV in the southern region of the country, especially the age group that encompasses adolescence. In the future, deeper knowledge of the local reality may determine preventive measures and improvement in care quality for these patients, as well as provide a consultation basis for other studies. Given the above, this study aimed at characterizing the epidemiological profile of HIV/AIDS cases in adolescents.

## METHOD

This is a cross-sectional and descriptive study. The study method was guided by the *Strengthening Reporting of Observational Studies in Epidemiology* (STROBE) Statement.<sup>(16)</sup> The population consisted of all HIV/AIDS cases in the age group between 13 and 19 years old (N=84) reported in the National System of Information about Notifiable Diseases (*Sistema Nacional de Informação de Agravos de Notificação*, SINAN) made available by the Epidemiological Surveillance office of a municipality from southern Brazil, from January 1<sup>st</sup>, 2007 to December 31<sup>st</sup>, 2019. Data collection was conducted between February and March 2020.

The age lower limit, 13 years old, was established based on the criteria adopted by the MS for notification of cases in the SINAN.<sup>(17)</sup> For the higher age limit considered in this study, 19 years old, the adolescents' characterization follows the World Health Organization (WHO) guideline.<sup>(18)</sup>

The variables of interest included in the descriptive analysis were as follows: age, gender, race/skin color, schooling, size of the municipality of residence, transmission mode, laboratory evidence, OIs according to the Rio de Janeiro/Caracas Criterion and the Center for Disease Control and Prevention (CDC) Criterion, adapted to define AIDS cases and case evolution.<sup>(19)</sup> The municipality under analysis is considered large, third in number of inhabitants in southern Brazil, with more than half a million inhabitants. It has 133 public health facilities, including a Testing and Counseling Center (*Centro de Testagem e Aconselhamento*, CTA) and exclusive outpatient service for PLHIV.<sup>(20)</sup>

The size of the municipality of residence was stratified in small size I (up to 20,000 inhabitants), small size II (from 20 to 50,000 inhabitants), medium size (from 50 to 100,000 inhabitants) and large size

The incidence analysis of the cases of disease in this population was performed by quadrennium according to the diagnosis date described in the SINAN: from 2007 to 2010, from 2011 to 2014, from 2015 to 2018 and the year 2019 alone. The mortality coefficient was calculated using the following formula: (number of deaths due to AIDS, in a given location and period/total population of the same place and period) x 100,000. The data were exported from the Excel program and analyzed in the IBM *Statistical Package for the Social Sciences* (SPSS), version 20.0® Descriptive statistics were applied, with absolute and relative frequency measures of the variables of interest.

The study is part of a project submitted and approved by the Research Ethics Committee involving Human Beings with CAAE: 00603718.6.0000.5231, opinion number: 2,978,859; in compliance with the determinations set forth in Resolution 466/2012. To ensure secrecy of the information, the researchers signed the Confidentiality and Secrecy Agreement. The Free and Informed Consent Form (FICF) was waived for this being a study using secondary data.

## RESULTS

During the study period, 84 HIV/AIDS cases were recorded in adolescents in the municipality. A continuous growth in the number of cases was evidenced, with emphasis on the quadrennium period between 2015 and 2018 as described below. The cases for this disease in this population are distributed as follows: 1<sup>st</sup> quadrennium: 2007-2010 with 14 cases; 2<sup>nd</sup> quadrennium: 2011-2014 with 26 cases, 3<sup>rd</sup> quadrennium: 2015-2018 with 41 cases; and 3 cases were diagnosed in 2019. During the study period, two PLHIV evolved to death, resulting in a specific mortality coefficient for this selected cause of 0.35/100,000 inhabitants.

Table 1 shows the demographic data of these individuals.

Observing Table 2, it appears that the most evident transmission form was overt sexual behavior, with prevalence of homosexual relationships among men (75.0%).

Table 3 presents diverse information regarding access for laboratory diagnosis. With regard to the Rapid Test (RT), performed at the CTA and other health services, such as Basic Health Units (BHUs), with easy access, it was found that 67.9% performed RT1 already with reagent results.

In relation to the laboratory tests, 39.3% resulted in a first reagent test, while 36.9% needed a confirmatory test and, in 61.9% of the cases, this type of testing was not performed. It is noteworthy that RT and laboratory techniques hardly overlap, performing the method of choice by the health professional and patient, whose access is possible. In addition, 32.1% of these individuals (n=27) underwent LT-CD4+ count tests according to the CDC criterion, at the time of diagnosis.

In Table 4, it was observed that, in the Rio de Janeiro/Caracas criterion, 17 of the 84 individuals already had AIDS-defining clinical signs. By the

Epidemiological characterization of HIV/AIDS.. modified CDC criterion, 32.1% of the individuals had LT-CD4+  $\leq$  350 cells/mm<sup>3</sup> at diagnosis. In this sense, the most prevalent OIs were oral candidiasis/hairy leukoplakia (6.7%), CNS alteration (4.4%) and lymphadenopathy (4.4%).

## DISCUSSION

The study aimed at characterizing adolescents living with HIV/AIDS in southern Brazil. Adolescence is a critical phase of body self-knowledge and experimentation, generating risk behaviors by adolescents, such as unprotected sexual intercourse and experiences with licit and illicit drugs, demanding attention and public policies intrinsic to this population.<sup>(21)</sup> A study carried out in a reference center belonging to Paraná's 10<sup>th</sup> Health Region, and another two in the Brazilian Northeast, analyzed adolescents with HIV/AIDS and, in line with this study, showed predominance of male gender and of the age group between 17 and 19 years old.<sup>(22-24)</sup>

In addition to this, a study that covers sexual behavior in the Brazilian urban regions points out that men initiate their sexual life earlier than women, indicating a greater chance of male individuals acquiring STIs also earlier, including HIV.<sup>(25)</sup>

However, it is not stated that only males are directly exposed. Studies that analyzed the epidemiological profile and another that covers adolescents' vulnerability to HIV, show feminization of the HIV/AIDS cases among adolescents aged from 13 to 19 years old.<sup>(8,14,26-28)</sup> This information reinforces the need to identify the particularities across regions and cultures, studying them in order to carry out assertive prevention actions.

According to the researchers in their studies, the increase in the percentage of sexual activity initiation in schoolers, which is becoming increasingly precocious, is directly proportional to the increase in age, facts that corroborate the results of this study, where there is more HIV/AIDS cases among the age group from 17 to 19 years old.<sup>(13,29-31)</sup> The higher prevalence of HIV infection in adolescents can be explained by the risk behaviors of this population, such as early sexual activity, non-use or discontinuous use of condoms and having multiple partners, among other factors.<sup>(22)</sup>

Factors such as race/skin color can also be related to culture and regionality, in addition to factors such as schooling and social status. In the current study there was predominance of Caucasians, according to similar results in other studies in Southern Brazil.<sup>(8,22,32)</sup> This finding can be explained by the colonization history in the northern region of Paraná, given that during the coffee cycle there was extensive foreign immigration in the first half of the 20<sup>th</sup> century.<sup>(33)</sup> Thus, foreign descent is significantly present in the population of northern Paraná, with emphasis on the presence of Italian, Portuguese, Spanish and German individuals.<sup>(34)</sup>



**Table 1** - Demographic analysis of the adolescents with HIV/AIDS, from 2007 to 2019. Londrina, PR, Brazil, 2019.

Variables	n	%
<b>Gender</b>		
Male	62	73.8
Female	22	26.2
<b>Age (in years old)</b>		
13-16	6	7.1
17-19	78	92.9
<b>Race/Skin Color</b>		
White	58	69.0
Not white	26	31.0
<b>Schooling</b>		
No schooling	8	9.6
Complete/Incomplete Elementary School	16	19.0
Complete/Incomplete High School	42	50.0
Complete/Incomplete Higher Education	16	19.0
Unknown	2	2.4
<b>Size of the Municipality of Residence</b>		
Large	61	72.6
Medium	12	14.3
Small size I	8	9.5
Small size II	3	3.6
<b>Total</b>	<b>84</b>	<b>100.0</b>

Source: The author.

**Table 2** - Descriptive analysis of the types of exposure among adolescents with HIV/AIDS, from 2007 to 2019. Londrina, PR, Brazil, 2019.

Exposure	N	%
Sexual relationships with men	63	75.0
Sexual relationships with men and women	11	13.1
Sexual relationships with women	8	9.5
Vertical transmission	2	2.4
Injectable drug use	1	1.2
Blood transfusion	1	1.2

Source: The author.

**Table 3** - Distribution of diagnostic results and type of testing among the adolescents with HIV/AIDS, from 2007 to 2019. Londrina, PR, Brazil, 2019.

Variables	Reagent		Non-Reagent		Not performed		Unknown	
	n	%	n	%	n	%	n	%
Rapid Test 1	57	67.9	-	-	27	32.1	-	-
Rapid Test 2	57	67.9	-	-	27	32.1	-	-
Laboratory evidence of HIV infection	33	39.3	1	1.2	50	59.5	-	-
Laboratory evidence of HIV infection (confirmatory test)	31	36.9	1	1.2	52	61.9	-	-
Rapid Test 3	4	4.8	-	-	79	94.0	1	1.2

Source: The author.

With regard to schooling, the emerging countries that make up BRICS - Brazil, Russia, India, China and South Africa - held meetings to discuss cooperation in several aspects, including education. Despite the efforts to improve schooling, in addition to quality and equality, through educational plans and policies, there is a significant presence of illiterates within the population analyzed. Brazil presented an illiteracy rate of 6.6% in individuals aged 15 years old and over. In the South region, this rate is significantly lower (3.3%), although still not ideal.<sup>(35)</sup>

The main reason given by the adolescents for never having attended or for dropping out school was the priority to work, suggesting that low socioeconomic status interferes with the adolescent's permanence in school.<sup>(36)</sup> Of the 300,496 Brazilians with HIV diagnosed between 2007 and 2019, most corresponded to cases who had completed High School, as well as the data found in this research and in a study conducted in the Northeast of the country.<sup>(8,26)</sup>

Low schooling level inversely reflects the risk for early sexual initiation, in addition to educational level being inversely proportional to the number of AIDS cases.<sup>(29,37,38)</sup> This risk exposure turns adolescents into a more vulnerable population.<sup>(39)</sup> In a systematic review regarding this characteristic of adolescents exposed to HIV/AIDS, a discrepancy between sex information and safe sexual practice was observed, resulting in faulty knowledge and sexual intercourse.<sup>(40)</sup>

**Table 4** - Distribution of the signs/symptoms according to the Rio de Janeiro/Caracas criterion, and the main opportunistic infections according to the adapted CDC criterion, manifested in the adolescents with HIV, from 2007 to 2019. Londrina, PR, Brazil, 2019.

Variables	n	%
<b>Rio de Janeiro/Caracas Criterion</b>		
Cachexia (weight loss greater than 10%)	9	20.0
Asthenia for more than a month	7	15.6
Persistent cough	6	13.3
Diarrhea for more than a month	4	8.9
Fever for more than a month	4	8.9
Anemia/Lymphopenia/Thrombocytopenia	3	6.7
<b>Adapted CDC Criterion</b>		
Oral candidiasis/Hairy leukoplakia	3	6.7
CNS* dysfunction	2	4.4
Lymphadenopathy	2	4.4
Persistent dermatitis	1	2.2
Herpes Zoster	1	2.2

\*Central Nervous System

Source: The author.

A previous study with data up to mid-2010, which analyzed all 399 municipalities in the state of Paraná, showed that Londrina was the second municipality with the highest number of notifications of this condition, only behind the state capital, Curitiba, evidencing that, among the municipalities analyzed in this study, Londrina had significant predominance.<sup>(41)</sup> It is noteworthy that the total number of cases involved in the study exceeds the number of inhabitants of this municipality, as the municipality is a relevant hub in the northern region of the state in many issues, including health. There is also the stigma issue that make individuals, especially in their adolescence, seek health care in larger size cities, where their visibility is preserved.

In this research, the continuous growth of notified/confirmed HIV/AIDS cases in adolescents was evidenced through the quadrennium analysis, which reinforces the ascending curve of cases for this condition in this population, according to other studies.<sup>(27,28)</sup>

Between 2008 and 2018, there was a reduction in AIDS mortality in Brazil and in the South region specifically, with a 43.8% decrease. From 2016 to 2018, there was a drop in the mortality rate in the age group from 15 to 19 years old. Paraná also presented a 22.9% decline in its standardized mortality coefficient in the same period.<sup>(8)</sup>

The HIV infection diagnosis is established through immunoassays, which can be performed in laboratories or RTs outside the laboratory environment, the latter being essentially performed in health services. The diagnostic flowchart for HIV consists of two reagent results in RT1 and RT2 serially, and consists of different antigens, in addition to a confirmatory laboratory test via viral load quantification, in which 5,000 copies or more confirm infection, as well LT-CD4+ count.<sup>(42)</sup>

When analyzing the data from this study, there were multiple searches for detection of the presence of the virus in the health system, thus evidencing the assured access to diagnostic tests in the municipal health networks in northern Paraná. However, in the same way that it proves to be a favorable situation, successive exposure to STIs is verified, indicating

failures in the interventions regarding the adolescents' sexual health.

After infection, it is known that LT-CD4+ is an effective biomarker used to establish whether or not people with HIV develop AIDS.<sup>(43)</sup> The count of this biomarker categorizes the immunological conditions of these individuals according to the adapted CDC criterion for these infections.<sup>(42)</sup>

Despite this, Antiretroviral Therapy (ART) should be initiated immediately for all adolescents with HIV, regardless of clinical criteria and LT-CD4+ counts, in order to reduce morbidity and mortality and protect the immune system of these adolescents. This is because a late diagnosis, with the presence of OIs, leads to hospitalizations and burdens not only on the health system but also on social security, as well as harms to their academic and professional future.<sup>(9,13)</sup>

The HIV transmission form can be multifactorial, which favors an individual having more than one exposure type. The habit of using injectable drugs and also having unprotected sex can be cited as examples. Thus, the number of exposures can be higher than the population analyzed.<sup>(44)</sup> In the current study, exposure was predominantly through sexual intercourse, as evidenced in other studies.<sup>(22,24)</sup> Although the results of the analysis show higher HIV/AIDS prevalence of cases among men who have sex with men, other studies show that the exposure category is increasing or even higher is heterosexual men.<sup>(10,24,31,45)</sup>

In a WHO technical note, studies were published whose results evidence that the risk of contracting HIV among young men who have sexual relations with other men is greater than in the heterosexual category.<sup>(46)</sup> Regardless of sexual orientation, education in health and preventive measures are necessary.

Research studies that use secondary data have their limitations, characterized by weakness in data validation and reliability due to the information biases (interviewer bias, collection instrument bias), in addition to depending on correct filling-out of the collection instruments, as well as on the concentration and commitment level for those who

fill them out. Another limitation is that inferential analyses were not performed.

It is hoped that this study will contribute to reflections related to HIV/AIDS in adolescence, as the inherent vulnerability of this stage of life needs to be highlighted, as well as the health policies that guide actions for the prevention and early diagnosis of infection caused by HIV/STIs in this age group need to be intensified. In addition to this, this study benefits the deliberation of local leaders and health professionals in the epidemiological HIV/AIDS scope.

## CONCLUSION

The analysis of the HIV/AIDS cases reported among adolescents in the city of Londrina between 2007 and 2019 revealed predominance of infection in adolescents aged from 17 to 19 years old, male, white-skinned, with complete or incomplete High School, and living in the large cities of northern Paraná. Viral contagion was essentially through sexual intercourse and mainly affected individuals who reported homosexual relationships between men. It is noted that there is extensive diagnostic testing for PLHIV/AIDS, although with a low focus on interventions aimed at prevention.

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