

Original Article

## Retrospective observational study on the epidemiological profile of people living with HIV/AIDS in Pernambuco state, Brazil

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### Abstract

**Introduction:** HIV/AIDS is a major global public health concern. In Pernambuco state, Brazil, the number of people living with HIV/AIDS (PLWHA) is among the highest in the country. Herein, a cross-sectional retrospective observational study was carried out with 811 PLWHA followed up at the Clinical Hospital, Pernambuco, Brazil, between 2013 and 2017.

**Methodology:** The patients' sociodemographic and behavioral data were obtained by interview. Information about HIV load and CD4 T lymphocyte count were obtained from patients' records. Data were analyzed for both the total number of PLWHA and gender.

**Results:** Recife municipality had the highest number of PLWHA. Most PLWHA were 40-44 years old, male, brown ethnicity, heterosexual, single, with elementary education, used condoms regularly, shared sharp objects, had surgery, had no non-HIV sexual infection, did not receive transfusions, did not use injectable drugs, and had no tattoo. The median of first and last CD4 T lymphocyte counts were 241 and 549.5 cells/mm<sup>3</sup>, respectively. The first HIV load had a median of 14,882 copies/mL (IQR = 613-109,750 copies/mL). Regarding the last viral load, 63.74% had an undetectable load. All patients were using antiretroviral therapy, mean time of 5.9 (± 5.5) years. This epidemiological and medical profile was maintained when PLWHA were analyzed according to gender, except for the report of another sexually transmitted infection, in which 51.4% of men (268/521) reported having/or having had it.

**Conclusions:** The epidemiological profile of PLWHA in Pernambuco, Brazil, was described. This regional characterization is useful for directing public health policies, contributing to population-directed decision making.

**Key words:** Public health; infectious disease; HIV/AIDS; epidemiology; population characteristics.

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### Introduction

Almost 40 years after the first report of *Human immunodeficiency virus* (HIV) infection, HIV/AIDS is still one of the main global public health concerns [1]. At the end of 2019, an average of 38 million people were living with HIV/AIDS (PLWHA) worldwide, of which 1.7 million (1.2-2.2 million) people were infected that year. In addition, 690,000 people died from AIDS-related disease in 2019, mainly on the African continent [2].

In Brazil, in 2019, 41,919 new HIV cases, 37,308 AIDS cases and 10,565 AIDS-related deaths were registered [3]. Although these numbers are considerable, Brazil has experienced a decrease in the

AIDS detection rate, as well as in AIDS-related deaths, mainly due to the availability of antiretroviral therapy (ART) and early diagnosis. Between 2012 and 2019, for example, the AIDS detection rate decreased from 21.9/100,000 to 17.8/100,000 inhabitants. Regarding AIDS-related deaths, the decrease was 28.1% between 2014 and 2019 [3].

The Brazilian territory is divided into five geographic regions: North, Northeast, Central-West, Southeast and South. In 2019, more than half of the new HIV cases were concentrated in the Southeast and Northeast regions: 14,778 (35.3%) and 10,752 (25.6%), respectively [3]. Furthermore, in contrast to the national trend of decreasing AIDS detection rates, the Northeast

showed a 17% increase in the AIDS detection rate between 2008 and 2018 [4].

Historically, Pernambuco is the Northeast state with the highest number of AIDS-related deaths, with 12,616 deaths between 1980 and 2019. From 2008 to 2019, the HIV detection rate also increased in Pernambuco [3]. Concerning Recife, Pernambuco's capital, the city ranks fourth among the Brazilian capitals with the highest HIV/AIDS composite index, considering the latest update from the Ministry of Health of Brazil. Briefly, this index comprises the HIV detection rate in the general population, the AIDS-related mortality rate, and the HIV detection rate in children under 5 years of age. In addition, the HIV/AIDS composite index also considers the average of the first CD4 T lymphocyte count [3].

Given the above, a cross-sectional retrospective observational study was carried out on the sociodemographic and behavioral characteristics of PLWHA followed up at a hospital specializing in the treatment of HIV/AIDS cases in Recife, Pernambuco, Brazil, between 2013 and 2017.

## Methodology

### *Study design and region*

This work is a retrospective cross-sectional observational study on PLWHA followed up at the Clinical Hospital, Federal University of Pernambuco (*Universidade Federal de Pernambuco*, UFPE), Recife, Brazil, between 2013 and 2017.

**Figure 1.** Intermediate geographical region of residence of people living with HIV/AIDS followed up at the Clinical Hospital, Pernambuco state, Brazil, between 2013 and 2017. Among the 811 PLWHA analyzed in this study, 770, 36, 4 and 1 were inhabitants of Recife, Caruaru, Petrolina and Serra Talhada intermediate regions, respectively. The Clinical Hospital is in Recife municipality. The map of Pernambuco used here was adapted by the authors and its original version is freely available on the Wikimedia Commons website [14].



Pernambuco is a member-state of the Northeast region and occupies an area of 98,312km<sup>2</sup>. Pernambuco has 185 municipalities, which are distributed in four intermediate geographical regions: Recife (72), Caruaru (63), Serra Talhada (25) and Petrolina (25) (Figure 1). The Clinical Hospital (UFPE), located in Recife, is a hospital specializing in the care of PLWHA and receives patients from the four intermediate regions of Pernambuco.

### *Study population and data collection*

This study was carried out with 811 PLWHA followed up at the Clinical Hospital (UFPE). Information about HIV load and CD4 T lymphocyte count were obtained from patients' records. Data on the patients' sociodemographic and behavioral characteristics were obtained by interview conducted after signing the informed consent form (Tables 1-3). Data collection was performed between 2013 and 2017, and corresponds to patients analyzed in previous and different studies of our research group. These studies were approved by the ethics committee, codes 22428813.5.0000.5208, 45156215.5.0000.5208, 5156215.5.0000.5208 and 65623017.0.0000.5208 (Ethics and Research Committee of the Center for Health Sciences, UFPE). The exclusion criteria were pregnant women, patients under 18 years old or patients with neurological diseases.

## Results

A total of 811 PLWHA, of which 770, 36, 4 and 1 were inhabitants of Recife, Caruaru, Petrolina and Serra Talhada intermediate geographical regions, respectively, were analyzed (Figure 1). The Recife municipality, followed by Jaboatão dos Guararapes, both located in Recife intermediate region, had the highest number of PLWHA, 329 and 113, respectively. The PLWHA number per municipality is listed in Supplementary Tables 1-4.

Among the 811 PLWHA described here, 64.2% (521/811) were male. The average age of the patients was 43.21 ( $\pm$  11.23) years old; 43.87 ( $\pm$  11.35) and 42.02 ( $\pm$  10.92) for men and women, respectively. Considering the age groups, most PLWHA were 40-44 years old (17.4%). When analyzing the age groups according to gender, it was observed that most male and female patients were 45-49 (87, 16.7%) and 40-44 (58, 20%) years old, respectively (Table 1).

Regarding sociodemographic characteristics, most participants were brown ethnicity (417/811), heterosexual (565/811), single (399/811) and studied up to elementary school (378/811). These characteristics

**Table 1.** Age groups of patients living with HIV/AIDS followed up at the Clinical Hospital, Pernambuco state, Brazil, between 2013 and 2017.

Age groups*	Total, n (%)	Male, n (%)	Female, n (%)
18-19	6 (0.74)	3 (0.6)	3 (1)
20-24	27 (3.3)	16 (3)	11 (3.7)
25-29	66 (8.1)	36 (7)	30 (10.3)
30-34	86 (10.6)	61 (11.7)	25 (8.7)
35-39	120 (14.8)	71 (13.7)	49 (16.9)
40-44	141 (17.4)	83 (16)	58 (20)
45-49	137 (16.9)	87 (16.7)	50 (17.2)
50-54	110 (13.6)	81 (15.5)	29 (10)
55-59	59 (7.3)	40 (7.6)	19 (6.6)
> 60	59 (7.3)	43 (8.2)	16 (5.6)

\* The age groups were defined considering both the exclusion criteria of the study and the age group adopted in the HIV/AIDS data available from the Ministry of Health of Brazil.

remained the most observed when patients were analyzed according to gender (Table 2). All participants had sexual intercourse, 65.4% (530/811) regularly used condoms, 63% (511/811) had undergone some surgical procedure, 59.8% (485/811) shared sharp objects, 57% (462/811) did not have another sexually transmitted infection (STI), 71.3% (578/811) did not receive a transfusion, 98.3% (797/811) did not use injectable drugs, and 80.9% (656/811) had no tattoo (Table 3). All these characteristics also remained the most observed when patients were analyzed according to gender, except for the report of another STI. Here, 51.4% of men (268/521) had a history of non-HIV sexual infection (Table 3).

The patients had a median of first and last CD4 T lymphocyte counts of 241 and 549.5 cells/mm<sup>3</sup>, respectively. The first HIV load had a median of 14,882 copies/mL (IQR = 613-109,750 copies/mL). In the last

viral load, almost 63.74% (517/811) had an undetectable viral load, < 40 copies/mL, while about 36.25% (294/811) had a HIV load with a median of 494 copies/mL (IQR = 55-15,648 copies/mL). All patients were using ART, mean time of 5.9 ( $\pm$  5.5) years.

When considered according to gender, the first and last CD4 T lymphocyte counts had a median of 239 and 567.5 cells/mm<sup>3</sup> for women, and 242.5 and 545 cells/mm<sup>3</sup> for men, respectively. Regarding the HIV load, the first viral load for women and men was 10,176 (IQR = 435-89,496 copies/mL) and 18,000 copies/mL (IQR = 701-130,404 copies/mL), respectively. For last HIV load, almost 68.27 (198/290) and 61.22% (319/521) women and men, respectively, had an undetectable viral load. Women and men with the last detectable viral load had 541.5 (IQR = 54.25-33,437 copies/mL) and 518.5 copies/mL (IQR = 54.5-15,188 copies/mL), respectively. The mean time on ART for

**Table 2.** General characteristics of patients living with HIV/AIDS followed up at the Clinical Hospital, Pernambuco state, Brazil, between 2013 and 2017.

General characteristics	Total, n (%)	Male, n (%)	Female, n (%)
<b>Ethnicity</b>			
White	207 (25.5)	157 (30.1)	50 (17.2)
Black	170 (21)	105 (20.2)	65 (22.4)
Brown	417 (51.4)	250 (48)	167 (57.6)
Indigenous	10 (1.2)	7 (1.3)	3 (1)
Yellow	7 (0.9)	2 (0.4)	5 (1.7)
<b>Sexual orientation</b>			
Heterosexual	565 (69.7)	280 (53.7)	285 (98.2)
Homosexual	160 (19.7)	158 (30.3)	2 (0.7)
Bisexual	86 (10.6)	83 (15.9)	3 (1)
<b>Marital status</b>			
Single	399 (49.2)	283 (54.3)	116 (40)
Married	183 (22.6)	117 (22.5)	66 (22.8)
Cohabiting	149 (18.4)	90 (17.2)	59 (20.3)
Divorced	45 (5.5)	26 (5)	19 (6.6)
Widower	35 (4.3)	5 (1)	30 (10.3)
<b>Education</b>			
Illiterate	174 (21.5)	92 (17.7)	82 (28.2)
Elementary School	378 (46.6)	248 (47.7)	130 (44.9)
High school	123 (15.2)	91 (17.4)	32 (11)
University education	70 (8.6)	59 (11.3)	11 (3.8)
Uninformed	66 (8.1)	31 (5.9)	35 (12)

women and men was 5.7 ( $\pm$  5.3) and 6.1 ( $\pm$  5.7) years, respectively.

## Discussion

Here, most PLWHA were from Recife intermediate region, specifically from Recife and Jaboatão dos Guararapes municipalities. These municipalities are the most populous in Pernambuco state [5], which is probably reflected in the highest attendance of HIV/AIDS cases. In addition, the hospital considered in this study is located in Recife, contributing to the highest coverage of patients in this region.

In this study, the average age of PLWHA was 43.21 ( $\pm$  11.23) years, with most cases described in the 40 to 44 age group (141/811, 17.4%). Interestingly, these values differ considerably from those observed for Brazil during the same period. Between 2013 and 2017, most PLWHA in Brazil were between 25 and 29 years old [3]. Here, this age group ranked sixth in relation to the total number of HIV/AIDS cases (66/811, 8.1%).

On the other hand, the age groups most observed here are similar to those reported for some Brazilian states, considering both different periods and different regions. In Rio Grande do Sul state, Southern Brazil, for example, Galetto *et al.* [6] reported an average age of 40.6 ( $\pm$  10.8) years for 580 PLWHA analyzed from July 2008 to January 2009. In Goiás state, Central-West

Brazil, between 2005 and 2015, the average age for 539 PLWHA was 39.5 ( $\pm$  11) years [7]. Considering the age group according to gender, the results were also similar to other studies. For example, Melo *et al.* [8] observed that among 343 male PLWHA, almost 80% (273/343) were older than 35 years. Here, most male PLWHA were over than 30-34 years old.

When PLWHA were analyzed according to gender, it was found that most patients were male (521/811, 64.2%). This finding is in line with the total number of HIV/AIDS cases in Brazil for 2013-2017, of which almost 70% were men [3]. Other studies have also found a higher prevalence of male HIV/AIDS cases in the country. Similar to the results of this study, Dias *et al.* [7] and Trindade *et al.* [9] reported that 57.9% (312/539) and 59.8% (313/523) of PLWHA were men, in a study carried out in Goiás (2008-2009) and in Montes Claros (Minas Gerais state, between 1986 and 2016), respectively. The higher prevalence of male HIV/AIDS patients has also been described in other countries. In United States, for example, in 2018, 81% (30,691/37,968) of new HIV diagnoses were reported in men. Most of these cases, 86%, were attributed to men who had sex with men [10]. However, here, more than half of the male PLWHA, 280 (53.7%), identified themselves as heterosexual, and 158 (30.3%) and 83 (15.9%) claimed to be homosexual and bisexual,

**Table 3.** Behavioral characteristics and medical data of patients living with HIV/AIDS followed up at the Clinical Hospital, Pernambuco state, Brazil, between 2013 and 2017.

Characteristics/data	Total, n (%)	Male, n (%)	Female, n (%)
<b>Condom use</b>			
Yes	530 (65.4)	381 (73.1)	149 (51.3)
Sometimes	122 (15)	76 (14.6)	46 (15.9)
Not	142 (17.5)	57 (10.9)	85 (29.3)
Uninformed	17 (2.1)	7 (1.3)	10 (3.4)
<b>STI</b>			
Yes	349 (43)	268 (51.4)	81 (28)
Not	462 (57)	253 (48.6)	209 (72)
<b>Transfusion</b>			
Yes	231 (28.5)	138 (26.4)	93 (32)
Not	578 (71.3)	382 (73.3)	196 (67.6)
Uninformed	2 (0.2)	1 (0.1)	1 (0.3)
<b>Sharing sharp objects</b>			
Yes	485 (59.8)	277 (53.1)	208 (71.8)
Not	326 (40.2)	244 (46.9)	82 (28.2)
<b>Injecting drugs use</b>			
Yes	13 (1.6)	11 (2.1)	2 (0.7)
Not	797 (98.3)	509 (97.7)	288 (99.3)
Uninformed	1 (0.1)	1 (0.1)	0
<b>Tattoo</b>			
Yes	155 (19.1)	102 (19.6)	53 (18.2)
Not	656 (80.9)	419 (80.4)	237 (81.8)
<b>Surgery</b>			
Yes	511 (63)	277 (53.1)	234 (80.7)
Not	300 (37)	244 (46.9)	56 (19.3)

STI: Sexually transmitted infection.

respectively. This distribution follows the national trend. Considering Brazil data, between 2013 and 2017, 39.7, 30.72 and 7.4% of male HIV/AIDS cases were described in heterosexuals, homosexuals, and bisexuals, respectively [3].

Brown ethnicity (417/811, 51.4%), followed by white (207/811, 25.5%), was predominant in this study. These data are similar to those described for Brazil. According to the Brazilian Ministry of Health, between 2013-2017, most HIV/AIDS cases were described in both ethnicities, white (44%) and brown (43.5%) [3]. In general, the distribution of cases observed here is in line with the ethnic distribution of the Brazilian population. According to the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE), between 2012 and 2019, 46.8% of Brazilians declared themselves as brown, 42.7% as white, 9.4% as black and 1.1% as yellow or indigenous [11]. Interestingly, for female PLWHA, although brown ethnicity represents most HIV/AIDS cases, black ethnicity was more observed than white, and yellow more observed than indigenous ethnicity.

Elementary school patients, followed by illiterate, predominated in this study, both for total PLWHA and for PLWHA according to gender. This finding is also similar to that reported for HIV/AIDS cases in Brazil between 2013 and 2017. During this period, most PLWHA attended high school (38.4%) and elementary school (37.5%) [3]. Single patients were also the majority of PLWHAs analyzed here, considering total number and according to gender. Although being single does not directly imply multiple sexual partners, having multiple partners has been identified as a risk factor for HIV [12]. In addition, single status has also been associated with HIV infection [13].

Some characteristics or behaviors that may be associated with HIV/AIDS did not predominate in this study. Most PLWHA (total and according to gender) reported using condoms, not using injectable drugs, not having tattoos and not having received transfusions. All these aspects, however, have been associated as a risk factor for HIV [1,12]. Regarding other STI, another risk factor for HIV [1], most PLWHA reported not having it. However, when HIV/AIDS cases were analyzed according to gender, it was observed that 51.4% of men (268/521) reported a history of another STI. Most PLWHA (total and according to gender) were also submitted to some surgical procedure and share sharp objects. Importantly, despite these results, especially those related to behavioral characteristics, may be biased by the patients' response, they suggest the

heterogeneity of the HIV transmission pathways in this study population.

In general, the main laboratory parameters for monitoring PLWHA, *i.e.*, CD4 T lymphocyte count and HIV load, improve considerably between the date of diagnosis and data collection, considering both the total number of PLWHA and the analyses by gender. Treatment time was also very similar between the genders. This context reinforces the effectiveness of ART, as well as the importance of its continuation.

## Conclusions

In sum, this study described the sociodemographic and behavioral characteristics of 811 PLWHA followed up between 2013-2017 at the Clinical Hospital, Pernambuco state, Brazil, an important center specializing in the care of HIV/AIDS cases. Although previous studies have described several risk factors for HIV/AIDS, it is important to note that there is no universal profile of PLWHA. Therefore, this regional characterization of HIV/AIDS cases is essential for the adoption of local-oriented measures. Finally, considering the dynamics of HIV epidemiology, continuous monitoring of each region is also suggested so that public health policies are increasingly contemporary and effective.

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## Authors' Contributions

Maria Rosângela Cunha Duarte Coêlho and Thaísa Regina Rocha Lopes contributed equally to this study. Both authors analyzed the results and prepared the draft manuscript. Juliana Prado Gonçalves and Luan Araujo Bezerra contributed to data collection, interpretation of results and final review of the manuscript. Mirela Lopes Ribeiro and Georgeta Gertrudes Mendes de Oliveira Cahú contributed to the collection and organization of data. José Valter Joaquim Silva Júnior organized the study design, contributed to the interpretation and discussion of the results, assisted in the writing and final review of the manuscript.

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**Annex – Supplementary Items**

**Supplementary Tables.** Number of people living with HIV/AIDS per municipality of Pernambuco state, Brazil, followed up at the Clinical Hospital between 2013 and 2017.

**Supplementary Table 1.** Number of people living with HIV/AIDS per municipality of Caruaru intermediate geographical region, Pernambuco state, Brazil, followed up at the Clinical Hospital between 2013 and 2017.

<b>Caruaru</b>	<b>Case numbers</b>
Altinho	1
Arcoverde	2
Belo jardim	1
Bezerros	1
Buíque	1
Cachoeirinha	1
Caruaru	8
Chã Grande	2
Custódia	1
Garanhuns	2
Gravatá	5
Jupi	2
Manari	4
Paranatama	1
Santa Cruz do Capibaribe	3
Toritama	1
<b>TOTAL</b>	<b>36</b>

**Supplementary Table 2.** Number of people living with HIV/AIDS per municipality of Serra Talhada intermediate geographical region, Pernambuco state, Brazil, followed up at the Clinical Hospital between 2013 and 2017.

<b>Serra Talhada</b>	<b>Case numbers</b>
Tuparetama	1
<b>TOTAL</b>	<b>1</b>

**Supplementary Table 3.** Number of people living with HIV/AIDS per municipality of Petrolina intermediate geographical region, Pernambuco state, Brazil, followed up at the Clinical Hospital between 2013 and 2017.

<b>Petrolina</b>	<b>Case numbers</b>
Araripina	2
Trindade	2
<b>TOTAL</b>	<b>4</b>

**Supplementary Table 4.** Number of people living with HIV/AIDS per municipality of Recife intermediate geographical region, Pernambuco state, Brazil, followed up at the Clinical Hospital between 2013 and 2017.

<b>Recife</b>	<b>Case numbers</b>
Abreu e Lima	19
Aliança	5
Amaraji	1
Barreiros	4
Belém de Maria	1
Bom Jardim	3
Cabo de Santo Agostinho	35
Camaragibe	25
Carpina	15
Catende	1
Cidade Jaqueira	1
Condado	4
Escada	10
Feira Nova	4
Ferreiros	1
Frei Miguelinho	2
Gameleira	1
Goiana	5
Igarassu	10
Ipojuca	9
Itamaracá	5
Itambé	2
Itapissuma	2
Jaboatão dos Guararapes	113
João Alfredo	2
Lagoa de Itaenga	1
Limoeiro	5
Macaparana	2
Machados	2
Olinda	52
Palmares	2
Paudalho	4
Paulista	30
Pombos	2
Recife	329
Ribeirão	1
Salgadinho	2
São Lourenço da Mata	18
São Vicente Férrer	1
Sirinhaém	1
Surubim	6
Tamandaré	2
Timbauba	2
Vertentes	2
Vicência	3
Vitória de Santo Antão	23
<b>TOTAL</b>	<b>770</b>