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HIV infection in the west region of Pará: clinical and socioeconomic characterization

Infecção pelo HIV na região oeste do Pará: caracterização clínica e socioeconômica

Carla Beatriz Bezerra Melo¹

orcid.org/0000-0002-7786-8268
carlabeatrizbmg7@gmail.com

Jord Thyego Simplício de Lima²

orcid.org/0000-0001-8953-7311
jordthyego@gmail.com

Juciele Faria Silva²

orcid.org/0000-0003-2013-7496
jucielefsilva@gmail.com

Erek Fonseca da Silva³

orcid.org/0000-0003-3707-097X
enf_erekfonseca@hotmail.com

João Guilherme Pontes Lima Assy⁴

orcid.org/0000-0002-0551-6554
joaoassy@gmail.com

Renato do Carmo Said⁴

orcid.org/0000-0002-5308-0265
rdcsaid@gmail.com

Olívia Campos Pinheiro Berretta¹

orcid.org/0000-0002-9957-9301
livinhacp@hotmail.com

Luiz Fernando Gouvêa-e-Silva⁴

orcid.org/0000-0002-1953-9175
lfgouvea@yahoo.com.br

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Abstract

Aims: knowledge of the patient's profile, for the evaluation and suggested behaviors, promotes a favorable outcome. Thus, the objective of the study is to analyze the socioeconomic, clinical, and immunological characteristics of patients infected by the human immunodeficiency virus in the western region of the state of Pará.

Methods: were analyzed 1966 medical records of patients whose first visit to a reference center, in the municipality of Santarém-PA, was between 1998 and 2018. Socioeconomic, clinical, and immunological information was collected from patient medical records. Data were analyzed using descriptive and inferential statistics, adopting $p < 0.05$.

Results: there was a predominance of males (62.5%), aged 20-39 years (69.1%), elementary school (58.6%), single (57.3%), and employed (66.4%). Immunosuppression was present in 22% of patients and a viral load was detectable in 66%. Tuberculosis (37%) and toxoplasmosis (23%) predominated as opportunistic infections, and syphilis (62.6%) and human papillomavirus (HPV; 14%) as other infections.

Conclusions: it is concluded that both opportunistic infections and other infections were present in 25-22% of the patients and that the presence of opportunistic infections favors the installation of another infection, or vice versa. Toxoplasmosis, HPV, and syphilis are positively associated with men, and toxoplasmosis and tuberculosis with age >35 years. Immunosuppression was shown to be positively associated with men and age >35 years, as well as favoring the onset of tuberculosis, toxoplasmosis, and detectable viral load.

Keywords: HIV, acquired immunodeficiency syndrome, epidemiology, opportunistic infections.

Resumo

Objetivo: o conhecimento sobre o perfil do paciente para a avaliação e as propostas de condutas colabora com um desfecho favorável. Assim, o objetivo deste estudo é analisar as características socioeconômicas, clínicas e imunológicas de pacientes infectados pelo vírus da imunodeficiência humana na região Oeste do Estado do Pará.

Métodos: foram analisados 1.966 prontuários de pacientes que tiveram seu primeiro atendimento em um centro de referência, no município de Santarém (Pará), no período de 1998 a 2018. Levantaram-se informações socioeconômicas, clínicas e imunológicas nos referidos prontuários. Os dados foram analisados por estatística descritiva e inferencial, adotando-se $p < 0.05$.

Resultados: observou-se predominância do sexo masculino (62,5%), faixa etária de 20-39 anos (69,1%), ensino fundamental (58,6%), solteiros (57,3%) e com vínculo empregatício (66,4%). A imunossupressão estava presente em 22% dos pacientes e a carga viral detectável em 66%. A tuberculose (37,1%) e a toxoplasmose (23,6%)

¹ Universidade do Estado do Pará; Faculdade de Medicina, Santarém, PA, Brasil.

² Universidade Federal de Jataí; Programa de Iniciação à Pesquisa Científica, Tecnológica e em Inovação (Edital PRPI nº 01/2019), Jataí, GO, Brasil.

³ Centro de Testagem e Aconselhamento e Serviço Especializado de Assistência; Santarém, PA, Brasil.

⁴ Universidade Federal de Jataí; Jataí, GO, Brasil.

predominaram como infecções oportunistas, e a sífilis (14,1%) e o papiloma vírus humano (HPV; 3,2%) como outras infecções.

Conclusão: conclui-se que tanto as infecções oportunistas como as outras infecções estavam presentes em 25 (22%) dos pacientes e que a presença da infecção oportunista favorece a instalação da outra infecção, ou vice-versa. A toxoplasmose, HPV e a sífilis se associaram positivamente aos homens, bem como, a toxoplasmose e a tuberculose com as idades >35 anos. A imunossupressão demonstrou estar associada positivamente aos homens e idades >35 anos, bem como, favorece a instalação da tuberculose, da toxoplasmose e da carga viral detectável.

Palavras-chave: HIV, síndrome da imunodeficiência adquirida, epidemiologia, infecções oportunistas.

ABBREVIATIONS: AIDS, Acquired Immunodeficiency Syndrome; ART, Antiretroviral Therapy; CD4+, CD4+ T-lymphocyte count; CTC/SAS, Center for Testing and Counseling and Specialized Assistance Service; HIV, human immunodeficiency virus; HPV, human papillomavirus; TB, tuberculosis.

Introduction

Infection with HIV (human immunodeficiency virus) runs through a wide spectrum of clinical presentations, from the acute to advanced stage of the disease, with an estimated mean time between contagion and the onset of the disease of around ten years for untreated individuals. According to the Epidemiological Report, in the period from 2007 to June 2019, there were 300,496 cases of HIV infection in Brazil, and the cases of AIDS (acquired immunodeficiency syndrome) registered since 2013 have been decreasing, reaching 37,161 in the year 2018 (1).

After the diagnosis of HIV infection, the importance of introducing antiretroviral therapy (ART) to control viral load and improve the immune system is known. In addition, the Clinical Protocol and Therapeutic Guidelines for Adults recommend the prophylaxis of opportunistic infections to reduce morbidity and mortality in patients with immune dysfunction secondary

to HIV infection. There are two aspects to this prevention: primary prophylaxis (aims to prevent the development of opportunistic infections in individuals with previous exposure to these diseases, with the CD4 + T-lymphocyte count as the main guiding parameter); and secondary prophylaxis (aims to prevent the recurrence of previous opportunistic infections in patients who have already received full treatment) (2).

The correct use of ART is essential to reduce the possibility of developing opportunistic infections, with poor adherence to treatment being one of the factors that can influence the susceptibility of these patients to opportunistic infections. Poor adherence has a multifactorial origin, but late diagnosis of HIV, low education, age, adverse effects of therapy, and the number of medications are the main factors (3).

The CD4+ T-lymphocyte count (CD4+) is one of the most relevant biomarkers for assessing the urgency of starting ART and indicating immunizations and prophylaxis for opportunistic infections. From this examination, it is possible to analyze the degree of impairment in the defense system and the recovery of the immune response with the appropriate treatment. In addition, CD4+ count is significant in the baseline assessment, while viral load is considered the gold standard for monitoring the effectiveness of ART (2). Individuals with an CD4+ count <200 cells/mm³ more often develop opportunistic infections, thus demonstrating CD4+ count as an important factor in the onset of these infections (4).

Among the most common infections, tuberculosis, hepatitis C, and sexually transmitted infections, such as syphilis and human papillomavirus (HPV), are highlighted. The prevention and treatment indications for these diseases are the correct use of condoms, the use of disposable needles, and the correct administration of antiretrovirals, since, by

using these drugs to inhibit the action of the virus, there is a reduction in the predisposition of HIV-infected patients to acquire infections, increasing the survival of seropositive people (5).

Thus, the great relevance of studies on the socioeconomic, clinical, and immunological profile of patients diagnosed with HIV is evident, as research on the subject is scarce and, when carried out, is usually only for a short period of time. Thus, the objective of the current study is to analyze the socioeconomic, clinical, and immunological characteristics of patients infected by the human immunodeficiency virus in the western region of the state of Pará.

Methods

This is a descriptive study, with a quantitative (6) and retrospective (7) approach, carried out at the Center for Testing and Counseling and Specialized Assistance Service (CTC/SAS) in the municipality of Santarém, Pará, Brazil.

The population was made up of 2033 records of patients either diagnosed with or who had their first consultation for HIV infection at the CTC/SAS, from July 1998 to April 2018.

According to the inclusion criteria (older than 10 years and having their first consultation at the CTC/SAS from July/1998 to April/2018) and exclusion criteria (not presenting the date of diagnosis of HIV infection, sex, and age), 67 patient records were removed from the data collection. Thus, the sample consisted of 1966 patient records, from which socioeconomic, clinical, and immunological information was collected at the time of the first contact/consultation at the CTC/SAS.

To classify infections as opportunistic, the recommendations of the Ministry of Health (2, 8) and Focaccia (9) were adopted, and for non-opportunistic infections (other infections), the recommendations of the Ministry of Health (2,

8), Focaccia (9), and Kasper et al. (10). In addition, the cut-offs of Segatto et al. (11) were adopted for the CD4+ (< or ≥ 200 cells/mm³) and for viral load (detectable or undetectable - <50 copies).

For the evaluation of the AIDS immunodeficiency status, an CD4+ count of less than 200 cells/mm³, or the presence of opportunistic infection, or a cancer diagnosis were considered (12).

All the information collected was organized in spreadsheets to perform descriptive statistics (mean, standard deviation, absolute and relative frequency), as well as inferential statistics, using the G Test to make comparisons between genders. The Chi-square Test was used to verify the association of categorical variables and with viral load. When significant, the Odds Ratio Test was applied. The program used was BioEstat 5.3, adopting a level of significance of $p < 0.05$.

This study is part of a macroproject approved by the Research Ethics Committee of the State University of Pará, Campus XII - Santarém, under protocol number 2.544.662.

Results

The sample was composed of 1966 records of HIV-infected patients, of which 1,228 (62.5%) were male, from 24 municipalities in the state of Pará and other states ($n=7$; 0.4%). Regarding the origin, the top 10 municipalities in Pará were Santarém ($n = 1,207$; 61.4%), Óbidos ($n=132$; 6.7%), Oriximiná ($n=102$; 5.2%), Novo Progresso ($n=97$; 4.9%), Itaituba ($n=90$; 4.6%), Monte Alegre ($n=50$; 2.5%), Alenquer ($n=46$; 2.3%), Juriti ($n=37$; 1.9%), Jacareacanga ($n=31$; 1.6%), Mojuí dos Campos ($n=24$; 1.2%), Rurópolis ($n=24$; 1.2%), and the 13 remaining municipalities totaled 119 (6.1%) patients.

Table 1 shows the distribution, in general and by sex, of patients by age group, education, marital status, employment relationship, condom use, and sexual orientation.

TABLE 1 – Distribution of patients regarding socioeconomic characteristics.

Variables, n(%)	All n = 1966	Male n = 1228	Female n = 738
Age (years)			
10 - 19	152(7.7)	81(6.6)	71(9.6)
20 - 29	810(41.2)	491(40)	319(43.2)
30 - 39	549(27.9)	353(28.7)	196(26.6)
40 - 49	291(14.8)	191(15.6)	100(13.6)
50 - 59	124(6.3)	83(6.8)	41(5.6)
60 - 69	28(1.4)	19(1.5)	9(1.2)
70 - 79	12(0.6)	10(0.8)	2(0.3)
Schooling*			
Illiterate	39(2)	28(2.3)	11(1.5)
Primary Education	1,152(58.6)	655(53.3)	497(67.3)
Secondary Education	569(28.9)	375(30.5)	194(26.3)
Higher Education	202(10.3)	168(13.7)	34(4.6)
NF	4(0.2)	2(0.2)	2(0.3)
Marital Status			
Married/ Stable Union	754(38.4)	332(27)	422(57.2)
Single	1,126(57.3)	856(69.7)	270(36.6)
Divorced	41(2.1)	20(1.6)	21(2.8)
Widow/er	34(1.7)	14(1.1)	20(2.7)
NF	11(0.6)	6(0.5)	5(0.7)
Employed			
Yes	1,305(66.4)	1,077(87.7)	228(30.9)
No	648(33)	144(11.7)	504(68.3)
NF	13(0.7)	7(0.6)	6(0.8)
Use of Condom			
Yes	35(1.8)	28(2.3)	7(0.9)
No	1,270(64.6)	770(62.7)	500(67.8)
Sometimes	510(25.9)	339(27.6)	171(23.2)
NF	151(7.7)	91(7.4)	60(8.1)
Sexual Orientation			
Heterosexual	1,510(76.8)	778(63.4)	732(99.2)
Homosexual	318(16.2)	317(25.8)	1(0.1)
Bisexual	114(5.8)	114(9.3)	0(0)
Transsexual	1(0.1)	1(0.1)	0(0)
Transvestite	1(0.1)	1(0.1)	0(0)
NF	22(1.1)	17(1.4)	5(0.7)

NF, information not found; *Schooling may be complete/incomplete.

Table 2 shows the distribution of opportunistic infections presented by patients, in general and by sex. Although the diseases are presented in a single term, their different forms are grouped in this term. It is noted that men have more toxoplasmosis than women ($p=0.036$).

TABLE 2 – Distribution, in general and by sex, of the occurrence of opportunistic infections in patients.

Variables, n(%)	All n = 1,966	Male n = 1,228	Female n = 738
Without	1,481(75.3)	893(72.7)	588(79.7)
TB and its forms	179(9.1)	123(10.0)	56(7.6)
Toxoplasmosis and its forms	111(5.6)	80(6.5)	31(4.2)*
Candidiasis and its forms	81(4.1)	56(4.6)	25(3.4)
Herpes Simplex	46(2.3)	30(2.4)	16(2.2)
Herpes Zoster	43(2.2)	28(2.3)	15(2.0)
Cryptococcosis and its forms	11(0.6)	9(0.7)	2(0.3)
Pneumocystosis	8(0.4)	5(0.4)	3(0.4)
Histoplasmosis	2(0.1)	1(0.1)	1(0.1)
Paracoccidioidomycosis	2(0.1)	2(0.2)	0(0)
Visceral Leishmaniasis	1(0.1)	1(0.1)	0(0)
Kaposi's sarcoma	1(0.1)	0(0)	1(0.1)

TB, Tuberculosis. *G Test, statistical difference of male gender; $p<0.05$.

It is highlighted those 485 (24.7%) notifications of opportunistic infections were observed in patients, in addition to which, 73 (3.7%) of the patients had two or more opportunistic infections. Among the patients who presented opportunistic infections, the male gender was the most frequent ($n=274$; 68%), as well as single ($n=235$; 58.3%), age ≤ 35 years ($n=243$; 60.3%), with a mean age of 34.3 ± 11.1 years. In addition, it is important to point out that the status of AIDS immunodeficiency was 666 (33.9%) patients.

The other infections had 441 (22.4%) notifications (**Table 3**), of which 40 (2.0%) had two infections and 3 (0.2%) three concurrent infections. The mean age of this population was 32.2 ± 11.4 years, with predominance of the age group ≤ 35 years ($n=259$; 65.7%), the male sex ($n=310$; 78.7%) and being single ($n=270$; 68.5%). It is noteworthy that syphilis ($p<0.0001$), HPV ($p=0.015$) and urethritis ($p=0.005$) were more frequent in men.

TABLE 3 – Distribution, in general and by sex, of the occurrence of other infections in patients.

Variables, n(%)	All n = 1,966	Male n = 1,228	Female n = 738
Without	1,525(77.6)	876(71.3)	649(87.9)
Syphilis	278(14.1)	228(18.6)	50(6.8) [†]
HPV	62(3.2)	48(3.9)	14(1.9) [†]
Urethritis*	49(2.5)	40(3.3)	9(1.2) [†]
Hepatitis	33(1.7)	19(1.5)	14(1.9)
Leprosy	3(0.2)	3(0.2)	0(0)
Pneumonia	3(0.2)	3(0.2)	0(0)
Amebiasis	2(0.1)	2(0.2)	0(0)
Human T-Cell Lymphotropic Virus	2(0.1)	2(0.2)	0(0)
Upper airway infection	2(0.1)	2(0.2)	0(0)
Tegumentary Leishmaniasis	2(0.1)	1(0.1)	1(0.1)
Tinea Corporis	2(0.1)	2(0.2)	0(0)
Donovanosis	1(0.1)	1(0.1)	0(0)
Acute gastroenterocolitis	1(0.1)	1(0.1)	0(0)
Giardiasis	1(0.1)	0(0)	1(0.1)

HPV, Human Papillomavirus. *gonorrhea + chlamydia; [†]G Test, statistical difference of male gender; p<0.05.

It is noteworthy that of the 797 records of patients who presented an infection, opportunistic or other, 99 (5.0%) patients were diagnosed with both simultaneously. When associated with the presence of an opportunistic infection or other infection with sex, a positive association was observed between males for the development of opportunistic infection (p=0.012) and for another infection (p<0.0001). Thus, men are 1.35 times more likely to develop an opportunistic infection and 2.62 times more likely to develop another infection, compared to women.

Because syphilis, HPV, tuberculosis, and toxoplasmosis are the most frequent infections, odds ratios were applied to check the chance of

the event occurring in relation to sex. It was found that tuberculosis was not associated with sex, however men are 1.59 (p=0.040) times more likely to develop toxoplasmosis, 3.14 (p<0.0001) times more likely to acquire syphilis and 2.10 (p=0.019) times more likely to have HPV compared to women.

As syphilis, human papillomavirus (HPV), tuberculosis, and toxoplasmosis are the most frequent infections in the study, we investigated the association of these infections with age (**Table 4**). It was observed that the presence of HPV is associated with the age group ≤35 years (p=0.015). As for opportunistic infections, tuberculosis was associated with age group (>35 years; p=0.021), as was toxoplasmosis (p=0.035). Finally, having an opportunistic infection favored the installation of another infection (p=0.009), that is, patients with an opportunistic infection are 1.42 times more likely to acquire another infection.

TABLE 4 – Association of syphilis, human papillomavirus, tuberculosis, and toxoplasmosis regarding age.

Infections, n(%)	Age, years		P*	OR
	≤ 35 (n=1,321)	> 35 (n=645)		
Syphilis	178 (13,5)	100 (15,6)	0.25	---
HPV	51 (3,9)	11(1,7)	0.015	2.31
TB	106 (8,0)	73(11,3)	0.021	1.46
Toxoplasmosis	64 (4,8)	47 (7,3)	0.035	1.54

HPV, Human Papillomavirus; TB, Tuberculosis. OR, Odds Ratio; *Test Chi-square.

The analysis of the CD4+ count showed that 432 (22%) of patients presented <200 cells/mm³, 1,069 (54%) ≥200 cells/mm³, and 465 (24%) did not present an examination result. With respect to the viral load, it was noted that 223 (11%) patients were undetectable, 1,294 (66%) detectable, and 449 (23%) did not present an examination result.

From this information, the CD4+ count was associated with sex, age, presence of infections (opportunistic and others), syphilis, HPV, tuberculosis, toxoplasmosis, and viral load (**Table 5**).

TABLE 5 – Association of CD4+ T-lymphocyte count with sex, age, presence of opportunistic infections, other infections, and viral load.

Variables, n(%)	CD4+ T-lymphocytes (cells/mm ³)		p	OR
	< 200	≥ 200		
Sex				
Male	291(67)	626(59)	0.001	1.46
Female	141(33)	443(41)		
Age				
≤35 years	239(55)	799(75)	<0.0001	2.39
>35 years	193(45)	270(25)		
Opportunistic Infection				
Yes	169(39)	192(18)	<0.0001	2.94
No	263(61)	877(82)		
Other Infection				
Yes	86(20)	245(23)	0.22	---
No	346(80)	824(77)		
Toxoplasmosis				
Yes	57(13)	46(4)	<0.0001	3.38
No	375(87)	1,023(96)		
TB				
Yes	78(18)	82(8)	<0.0001	2.65
No	354(82)	987(92)		
Syphilis				
Yes	59(14)	165(15)	0.42	---
No	373(86)	904(85)		
HPV				
Yes	14(3)	47(4)	0.37	---
No	418(97)	1,022(96)		
Viral Load				
Detectable	372(88)	868(84)	0.026	1.49
Undetectable	49(12)	170(16)		

HPV, Human papillomavirus; TB, Tuberculosis. p, Test Chi-square; OR, Odds Ratio; p<0.05.

The association of the viral load, detectable or undetectable, with sex, age, and the presence of infections (opportunistic and others), with syphilis, HPV, tuberculosis, and toxoplasmosis was performed and a significant association was observed of the detectable viral load with the presence of other infections (p=0.010), and syphilis (p=0.003). Thus, other infections are 1.69 times more likely to be present in patients with a detectable viral load, and syphilis is 2.14 times more likely.

Discussion

In the period from 2007 to June 2019, the Epidemiological Report pointed out greater notifications for men (69%), complete high school education (20.7%), and the age group 20 to 34 years (52.7%). With respect to sexual orientation, for men, the majority were homosexuals (51.3%), while for women heterosexual orientation predominated (86.5%) (1). This information differs from the current study for the sexual orientation of men, for whom heterosexuality prevailed (61.8%), as well as which the predominant schooling was complete/incomplete primary education (58.6%).

The current study showed that the majority of people attended by the CTC/SAS in Santarém-PA are, in fact, from the city (61.4%). In contrast, a study carried out only with pregnant patients, found that most of the patients attended by the CTC/SAS of Santarém-PA came from neighboring cities, such as Óbidos-PA and Mojuí dos Campos-PA (13).

Regarding marital status, single people were the most common in the current study (57.3%), followed by married/stable union (38.4%). There is a greater propensity for single people to become infected with HIV, since many of them have multiple partners. A study conducted in the municipality of Santarém-PA, in 2014, found that 50% of patients were single, followed by 42% married/committed (14).

With respect to employment, the present research pointed out that most patients diagnosed with HIV are employed (66.4%). However, the study of Medeiros et al. (15), carried out in two reference hospitals in infectology in Rio Grande do Norte, demonstrated that most patients (63%) were not employed.

Regarding condom use, Brito et al. (16) observed that most of the research participants reported not using condoms (33.7%) or sometimes using them (20.2%), which was also noted in the current study.

The presence of an opportunistic infection is an important factor associated with death in patients with untreated AIDS, with many of these diseases being a representation of reactivation of latent infections, normally kept under control by a competent immune system, but not completely eliminated (17). In the current study, approximately

one fourth of the patients presented opportunistic infections, with tuberculosis (TB) and its forms (9.1%) and toxoplasmosis and its forms (5.6%) being the most common, as noted in a study carried out in the state of Rio Grande do Norte (18). Observing the distribution between sexes, toxoplasmosis was more present in men.

In addition, among patients who presented with an opportunistic infection, a higher frequency was observed in singles (58.4%), age ≤ 35 years (60%), and that 18% of patients had two or more opportunistic infections simultaneously. A study carried out in a Specialized Reference Unit for Special Parasitic Infectious Diseases, in the city of Belém-PA, demonstrated that most patients were also male (63.8%), single (66.99%), in the age group from 26 to 38 years (50%), with a frequency of patients affected by two opportunistic infections of 16% (19).

The positive association of toxoplasmosis for males observed in this study disagrees with the findings of Morais et al. (20), who found a slight prevalence of toxoplasmosis in females, when evaluating patients from the Marajó - PA region. However, a study conducted in Guayaquil, Ecuador, with HIV-infected patients, found a predominance of cases of toxoplasmosis among men (21). In addition, the socio-cultural characteristics of the Amazon region should be considered, as they favor contamination by the parasite, through the habit of consuming meat from game animals, often undercooked, working directly with the land as in agriculture, and living with cats in the space used by humans for housing or work, which are characterized as important risk factors for infection (22).

Among the other infections found in the study, sexually transmitted infections stand out, such as syphilis (14.1%) and HPV (3.2%). It is noteworthy that these two diseases were more frequent in men. However, the Syphilis Epidemiological Report shows that the notifications prevailed in females (59.4%) (23). In a study carried out in the state of Santa Catarina, this percentage was 4.2%, much lower than observed in the current study (24). Findings from the study of Duarte et al. (25), carried out with female riverside dwellers, not diagnosed with HIV, from 7 municipalities in the

state of Pará, observed a prevalence of syphilis of 16.4% of their sample. A similar prevalence (18.5%) was also observed in the study of Gaspar et al. (26) which was carried out in the state of São Paulo with women who tested positive for HIV. The result of the present study can be justified by the increase in the diagnosis rate of syphilis in the North, which increased by 59.3% in the period from 2018 to 2019, the largest increase in the rate of new diagnoses of syphilis among the Brazilian regions in this period (23).

Another prominent infection that showed a positive association with males was HPV. The fact that the majority of those infected with HPV are men is probably related to risky sexual behavior, prevalent in males, such as having multiple partners and not using condoms (27).

As for the association of age with the most frequent diseases, there was a positive association between TB and toxoplasmosis infection with age > 35 years. In relation to TB, this fact can be explained by the high prevalence of HIV/TB co-infection. From 2009 to 2017, 10% of new TB cases registered in Brazil were associated with HIV infection (28). In addition, there is a high incidence of TB in the age group > 30 years with the highest annual TB incidence coefficients occurring in patients aged 60 years or older (29). In this sense, Colombian HIV-infected patients demonstrated an increasing incidence of opportunistic infections with advancing age, with emphasis on TB, cerebral toxoplasmosis, and candidiasis (30).

As for the relationship between toxoplasmosis and age, it is possible to report that with the increased chance of contact with *Toxoplasma Gondii* at some point in life, advancing age, and the immunosuppression caused by HIV, reactivation of the disease may occur. In this sense, studies have identified that the age group of 30-49 years is more likely to develop toxoplasmosis (21, 31), as well as patients > 50 years old have a high seroprevalence index for toxoplasmosis (31). Configuring in this way, the increase of age as a risk factor for the development of the infection. Finally, the relationship between HPV and younger people may possibly be associated with greater

sexual activity among this public and with the non-use of condom (32).

The immunological profile of the participants in the present study showed that 22% of the patients had a count of CD4+ < 200 cells/mm³ and 54% were above this value. In addition, a positive association was also demonstrated between the presence of immunosuppression (CD4+ <200 cells/mm³) with detectable viral load, TB, toxoplasmosis, men, and age >35 years. HIV infection causes immunosuppression by destroying the body's defense cells, which favors the reactivation or development of opportunistic infections, especially TB (5). In the study of Crabtree-Ramirez et al. (33), performed with HIV/TB patients in Caribbean countries, South America, and North America, the authors observed that the CD4+ count at the time of diagnosis for TB ranged between 40 and 228 cells/mm³ (median 96 cells/mm³), therefore, the majority were immunosuppressed at the time of diagnosis. In addition, it should be highlighted that the majority of patients were men (77%) and the mean age was 35 years.

In a study conducted in the state of Maranhão, it was observed that 47% of patients with protozoa infection had a CD4+ count <200 cells/mm³ at the time of diagnosis. Among these infections, toxoplasmosis was the most prevalent, which provides evidence of the strong relationship between immunosuppression and toxoplasmosis (34).

In this sense, it is emphasized that the presence of immunosuppression is positively associated with the presence of opportunistic infection, that is, immunosuppressed patients are 2.93 times more likely to develop an opportunistic infection, as well as which the presence of another infection also favors the installation of an opportunistic infection, by 1.42 times. Thus, it is extremely important to recover and maintain a high CD4+ count to reduce the incidence of opportunistic infections (35).

Finally, viral load was undetectable (<50 copies) in 11% of patients and detectable in 66% of patients at the first visit. In addition, the presence of the detectable viral load was positively associated with the presence of other infections, specifically

syphilis. In this sense, 8% of HIV-infected patients co-infected with syphilis, at the time of diagnosis at a University Hospital in Recife-PE, had an undetectable viral load, and the majority of the sample (35.8%) had more than 100,000 copies (36).

In relation to the limitations of the present study, as in others carried out using medical records/spreadsheets, the non-completion or incorrect completion of information in the medical records/spreadsheets leads to an absence of information or the exclusion of the patient from the sample, resulting in data that may not be representative of the sample, and/or the variable studied, and/or the study location.

Thus, according to the proposed method, it can be concluded that, in the almost 20 years of care studied for HIV-infected patients at the CTC/SAS in Santarém - PA, at the first care appointment, the following patient factors predominated; male sex, in the 20-29 age group, with elementary school education (complete/incomplete), single, employed, heterosexual, and not using condoms during sexual intercourse. In addition, both opportunistic infections and other infections were present in 25-22% of the sample, and the presence of an opportunistic infection favored the installation of another infection, or vice versa. Toxoplasmosis, HPV, and syphilis were positively associated with males, and toxoplasmosis and TB with age >35 years.

Immunosuppression demonstrated a positive association with males and age >35 years, as well as favoring the installation of opportunistic infections, TB, toxoplasmosis, and detectable viral load. The detectable viral load, on the other hand, demonstrated a positive association with the presence of other infections and syphilis.

Notes

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The authors declare no competing interests relevant to the content of this study.

Authors' contributions

All the authors declare to have made substantial contributions to the conception, or design, or acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and they assume full responsibility for the integrity of these results.

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Carla Beatriz Bezerra Melo

Estudante de Medicina pela Universidade do Estado do Pará (UEPA), em Santarém, PA, Brasil.

Jord Thyego Simplicio de Lima

Estudante de Medicina pela Universidade do Estado do Pará (UEPA), em Santarém, PA, Brasil.

Juciele Faria Silva

Estudante de Fisioterapia e do Programa de Iniciação à Pesquisa Científica, Tecnológica e em Inovação (Edital PRPI nº 01/2019) pela Universidade Federal de Jataí (UFJ), em Jataí, GO, Brasil.

Erek Fonseca da Silva

Especialista em Gestão de Políticas em IST, HIV/AIDS, Hepatites Virais e Tuberculose pela Universidade Federal do Rio Grande do Norte (UFRN), em Natal, RN, Brasil; Enfermeiro do Centro de Testagem e Aconselhamento e Serviço Especializado de Assistência (CTA/SAE), em Santarém, PA, Brasil.

João Guilherme Pontes Lima Assy

Residência Médica em Infectologia pela Universidade de São Paulo (USP), em São Paulo, SP, Brasil; professor da Universidade do Estado do Pará (UEPA), em Santarém, PA, Brasil.

Renato do Carmo Said

Residência Médica em Infectologia pela Fundação Hospitalar do Estado de Minas Gerais, em Belo Horizonte, MG, Brasil; professor da Universidade do Estado do Pará (UEPA), em Santarém, PA, Brasil.

Olivia Campos Pinheiro Berretta

Mestre em Saúde da Amazônia pela Universidade Federal do Pará (UFPA), em Belém, PA, Brasil; Residência Médica em Infectologia pelo Hospital João de Barros Barreto - UFPA, em Belém, PA, Brasil; professora da Universidade do Estado do Pará (UEPA), em Santarém, PA, Brasil.

Luiz Fernando Gouvêa-e-Silva

Doutor em Doenças Tropicais pela Universidade Federal do Pará (UFPA), em Belém, PA, Brasil; Mestre em Genética e Bioquímica pela Universidade Federal de Uberlândia (UFU), em Uberlândia, MG, Brasil; professor do Laboratório de Anatomia Humana e Comparativa da Universidade Federal de Jataí, em Jataí, GO, Brasil.

Mailling address

Luiz Fernando Gouvêa-e-Silva
Universidade Federal de Jataí
Campus Jatobá - Cidade Universitária
BR 364, Km 192, 3800, Bloco 8
Zona de expansão urbana, 75801-615
Jataí, GO, Brasil

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