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HIV/AIDS em idosos: impacto epidemiológico e fatores de risco associados no Estado do Piauí, Brasil

HIV/AIDS in the elderly: epidemiological impact and associated risk factors in the State of Piauí, Brazil

VIH / SIDA en ancianos: impacto epidemiológico y factores de riesgo asociados en el Estado de Piauí, Brasil

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Resumo

O objetivo do presente estudo foi determinar a prevalência, perfil epidemiológico e socioeconômico e fatores de risco associados à infecção pelo HIV-1 em pacientes idosos com HIV/AIDS no estado do Piauí. Foram incluídos 805 indivíduos atendidos no Laboratório Central de Saúde Pública do Piauí. Os sujeitos foram classificados em dois grupos: um grupo de indivíduos de 18 a 59 anos e um grupo de 60 anos ou mais. Esses indivíduos foram testados para a infecção pelo HIV-1 (ELISA), que foi monitorada pela contagem de linfócitos TCD4 + / CD8 + (citometria de fluxo) e quantificação da carga viral (método de DNA ramificado) e para co-infecções com HBV, HCV e HTLV-1/2 (ELISA e PCR). Eles também responderam a um questionário epidemiológico sobre características sociodemográficas, epidemiológicas e clínicas. A frequência de infecção pelo HIV-1 em pacientes idosos foi de 3,7% (30/805). A maioria dos pacientes era do sexo masculino (66,6%), possuía ensino fundamental (90%), era casada (40%) e possuía renda familiar de 1 a 4 vezes o salário mínimo (63,3%). Os principais fatores de risco comportamentais associados a esses indivíduos incluíram falta de uso de preservativo (100%) e histórico de IST (53,3%), cirurgia (63,3%) ou transfusão de sangue (40%). Os idosos também apresentaram maior frequência de co-infecção HIV-HTLV-1/2 (13,3%). A identificação das principais características relacionadas à infecção pelo HIV em idosos é importante para mostrar que esses indivíduos também são suscetíveis à infecção pelo HIV-1 e devem estar cientes dos comportamentos de risco.

Palavras-chave: Epidemiologia; HIV; Idosos; Fatores de risco.

Abstract

The objective of the present study was to determine the prevalence, epidemiological and socioeconomic profile and risk factors associated with HIV-1 infection in elderly patients diagnosed with HIV/AIDS in the state of Piauí, Brazil. A total of 805 individuals seen at the Central Laboratory of Public Health of Piauí were included. The subjects were classified into two groups: a group of individuals 18 to 59 years old and a group of those 60 years or older. These individuals were tested for HIV-1 infection (ELISA), which was monitored by

TCD4+/CD8+ lymphocyte count (flow cytometry) and viral load quantification (branched DNA method), and for coinfections with HBV, HCV and HTLV-1/2 (ELISA and PCR). They also answered an epidemiological questionnaire on socio-demographic, epidemiological and clinical characteristics. The frequency of HIV-1 infection in elderly patients was 3.7% (30/805). The majority of patients were male (66.6%), had a primary school education level (90%), were married (40%) and had a family income of 1 to 4 times the minimum wage (63.3%). The main behavioral risk factors associated with these individuals included lack of condom use (100%) and a history of Sexual Transmitted Diseases – STI (53.3%), surgery (63.3%) or blood transfusion (40%). The elderly patients also had a higher frequency of HIV-HTLV-1/2 co-infection (13.3%). Identifying the main characteristics related to HIV infection in the elderly is important to show that these individuals are also susceptible to HIV-1 infection and must be made aware of risk behaviors.

Keywords: Epidemiology; HIV; Elderly; Risk factors.

Resumen

El objetivo del presente estudio fue determinar la prevalencia, el perfil epidemiológico y socioeconómico y los factores de riesgo asociados con la infección por VIH-1 en pacientes ancianos con VIH / SIDA en el estado de Piauí, Brasil. Se incluyeron un total de 805 personas atendidas en el Laboratorio Central de Salud Pública de Piauí. Los sujetos se clasificaron en dos grupos: un grupo de individuos de 18 a 59 años y un grupo de personas de 60 años o más. Estas personas se sometieron a pruebas de infección por VIH-1 (ELISA), que se monitorizó mediante recuento de linfocitos TCD4 + / CD8 + (citometría de flujo) y cuantificación de la carga viral (método de ADN ramificado), y para coinfecciones con HBV, HCV y HTLV-1/2 (ELISA y PCR). También respondieron un cuestionario epidemiológico sobre características sociodemográficas, epidemiológicas y clínicas. La frecuencia de infección por VIH-1 en pacientes de edad avanzada fue del 3,7% (30/805). La mayoría de los pacientes eran hombres (66,6%), tenían un nivel de educación primaria (90%), estaban casados (40%) y tenían un ingreso familiar de 1 a 4 veces el salario mínimo (63,3%). Los principales factores de riesgo conductuales asociados con estos individuos incluyeron la falta de uso del condón (100%) y antecedentes de ETS (53.3%), cirugía (63.3%) o transfusión de sangre (40%). Los pacientes de edad avanzada también tuvieron una mayor frecuencia de coinfección por VIH-HTLV-1/2 (13,3%). Identificar las características principales relacionadas con la infección por VIH en los ancianos es importante para mostrar que estas personas también son susceptibles a la infección por VIH-1 y deben ser conscientes de los comportamientos de riesgo.

Palabras clave: Epidemiología; VIH; Mayor; Factores de riesgo.

1. Introduction

In Brazil, between January 2007 and June 2017, 194,217 cases of HIV infection were reported, with most patients being male (n=131,969; 67.9%). The main age group affected by the infection is individuals 20 to 34 years old (52.5% of patients), and the elderly age group, comprising individuals over 60 years of age, is responsible for approximately 3.68% of infections (Brasil, 2017).

Elderly individuals are an important population at risk for HIV infection for reasons, such as: prevention campaigns against the infection do not target the elderly; the elderly do not consider themselves at risk; health professionals may not consider an HIV diagnosis in elderly patients, attributing the infection's symptoms to normal aging; the use of drugs for erectile dysfunction has increased the number of sexual relations for many elderly men; and the stigma of infection is greater among the elderly, causing them to avoid being tested or hiding a diagnosis of infection (Alencar & Ciosak, 2016; Pratt et al., 2010).

Another concern with HIV infection in the elderly is that despite having a good virological response to antiretrovirals, the reconstitution of CD4+ T lymphocyte levels is significantly slower than that observed in younger patients (Grabar et al., 2006), which increases the risk of serious diseases and mortality (Greig et al., 2012). In addition to that, HIV patients who use antiretroviral drugs retain a higher risk of developing cardiovascular disease and metabolic complications. The risk of myocardial infarction increases significantly with age and exposure to antiretroviral therapy (ART) (Friis-Møller et al., 2003).

In the Brazilian state of Piauí, there were a total of 41 AIDS cases among the elderly until 2009, with most residing in the capital, Teresina, where (n=27; 65,85%) cases were reported. These data likely do not represent the reality of HIV infection in the state, due to underreporting bias in this age group, which results from several factors, including a lack of health care for this population (Piauí, 2008).

In view of the evolution of the AIDS epidemic in the elderly, more effective control measures must be developed, in order to include the elderly population to identify the actual number of elderly individuals infected with HIV, to detect the disease early and to prevent the most serious complications. Thus, the aim of the present study was to determine the epidemiological profile and risk factors associated with HIV-1 infection in elderly patients with HIV/AIDS in the state of Piauí.

2. Materials and Methods

2.1 Study design

A cross-sectional study was conducted to evaluate the prevalence of infected elderly individuals among HIV-1 seropositive individuals. The study included 805 people over 18 years of age who were seen at the Central Laboratory of Public Health of the State of Piauí (*Laboratório Central de Saúde Pública do Estado do Piauí* - LACEN), which is located in the capital city of Teresina. These individuals underwent HIV-1 confirmation tests, monitoring ($TCD4^+/CD8^+$ T lymphocyte count and viral load quantification) and tests for coinfections (HBV, HCV and HTLV-1/2) from January 2007 to September 2007. The individuals were classified into two groups: one included individuals 18 to 59 years old, and the other included those 60 years or older.

Epidemiological data were collected through a simplified questionnaire that assessed socio-demographic information (sex, age, ethnicity, educational level, marital status, and family income) and behavioral characteristics (sexual preference, condom use, STD history, blood transfusion, sexual intercourse with drug users, use of intravenous drugs and sexual contact with sex workers).

2.2 Laboratory tests

HIV detection and confirmation

The presence of antibodies against HIV-1/2 was determined by an ELISA, Murex HIV-1.2.0 (DiaSorin, Saluggia, Italy). Infection was confirmed by the Western Blot Method using the HIV BLOT 2.2 kit (MP Biomedicals, Eschwege, Germany) and the nucleic acid sequence-based amplification (NASBA) method using the NucliSENS EasyQ HIV-1 V2.0 kit (BioMérieux, Marcy-l'Etoile, France). All tests were performed accordingly to the manufacturers' instructions.

Quantification of HIV-1 plasma viral load

Plasma viral load was determined by the branched DNA method (bDNA) with the Versant® HIV-1 RNA 3.0 Assay bDNA kit (Bayer Corporation, MA, USA), using the System 340 bDNA Analyzer (Siemens, Deerfield, USA).

Quantification of CD4+ and CD8+ T lymphocytes

The number of T lymphocytes was quantified by flow cytometry (FacsCalibur, Becton & Dickinson, NJ, USA) using the BD Trucount^{TM} Tubes and BD Multitest kit (Becton Dickinson, NJ, USA) of the National $CD4^+$ and $CD8^+$ T Lymphocytes Quantification Network.

Detection and confirmation of HBV, HCV and HTLV

The presence of antibodies and antigens was investigated by ELISA for the detection of anti-HBc (AxSYM Abbott, Chicago, IL, USA), HBV, anti-HVC (AxSYM Abbott, Chicago, IL, USA) and anti-HTLV-1/2 (Murex Biotech Limited, Darford, Kent, England). All tests were performed according to the manufacturers' instructions.

Positive samples in the serology test for HBV, HCV and HTLV infections were confirmed by real-time PCR for HBV and HCV (Oliveira-Filho et al., 2010) and by PCR-RFLP for HTLV (Oliveira et al., 2012), as described in the literature.

2.3 Statistical analysis

The statistical analysis was performed using the Statistical Package for Social Science (SPSS) – open version 19.0 for Windows. A descriptive and prevalence analysis was performed, including the distribution of hepatitis B, C and HTLV for qualitative variables. The possible associations between the elderly group and group of individuals younger than 60, to determine the probable risk factors, were tested using the chi-square with Yates' or Fischer's correction, when appropriate. Variables considered significant at $p<0.05$ were input in the model.

2.4 Ethical aspects

This study was approved by the Ethics Committee on Human Research of the Federal University of Piauí (*Universidade Federal do Piauí* – UFPI) under observation no. 0124.0045.000-07. All study participants were informed about the study objectives, and those who agreed to participate signed a free consent form and answered the epidemiological questionnaire.

3. Results

Among the 805 HIV-1 seropositive individuals, 775 were under 60 years old (96.3%), and 30 were older than 60 years (3.7%). Table 1 shows the frequency of the groups investigated in relation to the sociodemographic variables; most of the individuals were male (%). In the elderly group, most of the individuals reported being white (n=; 53.3%), with a primary education level (n=; 90%); significantly more individuals in the elderly group had a primary education level compared to the group with patients younger than 60 years old ($p = 0.006$). Most of the individuals over 60 years resided in the urban area (n=; 90%), reported living with their partners (n=; 40%), and had an income between 1 and 4 times the minimum wage (n=; 63.3%).

Table 1 - Socio-demographic characteristics of the HIV-1-infected groups studied in the State of Piauí, Brazil in 2007.

Variables	**<60 years n = 775 n (%)**	**> 60 years n = 30 n (%)**	***p***
Sex			
Male	466 (60.13)	20 (66.67)	0.570*
Female	309 (39.87)	10 (33.33)	
Ethnicity			
White	256 (33.03)	16 (53.33)	0.084*
Black/Mixed	518 (66.84)	14 (46.67)	
NI	1 (0.13)	0 (0.00)	
Educational level			
Up to primary school	536 (69.16)	27 (90.00)	0.006#
Above secondary school	239 (30.84)	3 (10.00)	
Residential area			
Urban area	735 (94.84)	27 (90.00)	0.537#
Rural area	39 (5.03)	3 (10.00)	
NI	1 (0.13)	0 (0.00)	
Marital status			
With partner	312 (40.26)	12 (40.00)	0.330#
Without partner	347 (44.77)	10 (33.33)	
Widowed	63 (8.13)	5 (16.67)	
Separated	42 (5.42)	3 (10.00)	
Other	11 (1.42)	0 (0.00)	
Family income (MW)			
< 1	221 (28.52)	10 (33.33)	0.414#
1 to 4	515 (66.45)	19 (63.34)	
>4	39 (5.03)	1 (3.33)	

NI = No Information; MW = Minimum Wage; * Chi-square test; #G test.
Source: Authors.

Table 2 shows the frequencies of behavioral characteristics of the groups investigated. Most of the elderly reported being heterosexual (n=; 86.6%), and all participants reported that they did not use condoms consistently, the frequency of which was significantly different from that of the under 60 age group. The analysis of the frequency of elderly individuals in relation to STDs showed a significant difference (p= 0.029); most of the elderly (n=; 53.3%)

had at least one STD. The frequencies of who underwent surgery and had blood transfusions were also significantly higher in the elderly subjects than in the non-elderly subjects (p= 0.001 and p= 0.009, respectively).

Table 2 - Behavioral characteristics among the HIV-1 infected groups studied in the State of Piauí, Brazil in 2007.

Variables	**<60 years n = 775 n (%)**	**> 60 years n = 30 n (%)**	***p***
Sexual preference			
Heterosexual	615 (79.4)	26 (86.7)	0.213
Homo/Bisexual	160 (20.6)	4 (13.3)	
Condom use			
Yes	73 (9.4)	0 (0.0)	0.001
Sometimes	702 (90.6)	30 (100)	
STD			
Yes	263 (33.9)	16 (53.3)	0.029
No	500 (64.6)	14 (46.7)	
NI	12 (1.5)	0 (0.0)	
Sex with sex workers			
Frequently	59 (7.6)	3 (10.0)	0.823
Occasionally	74 (9.5)	5 (16.7)	
Rarely	114 (14.8)	3 (10.0)	
Never	212 (27.4)	9 (30.0)	
Not applicable	315 (40.7)	10 (33.3)	
Surgery			
Yes	265 (34.2)	19 (63.3)	0.001
No	510 (65.8)	11 (36.7)	
Blood transfusion			
Yes	149 (19.2)	12 (40.0)	0.009
No	614 (79.3)	18 (60.0)	
NI	12 (1.5)	0 (0.0)	
Sex with drug users			
Yes	178 (22.9)	4 (13.3)	0.197
No	462 (59.6)	19 (63.4)	
NI	135 (17.4)	7 (23.3)	

IV drug use			
Yes	14 (1.8)	0 (0.0)	0.789
No	759 (97.9)	30 (100)	
NI	2 (0.3)		

NI = No Information; IV = Intravenous
Source: Authors.

The investigation of co-infections showed that 33.3% of the elderly had markers of infection for HBV (total anti-HBc), and only one elderly individual had co-infection with HCV. The analysis of the frequency of antibodies against HTLV showed a significantly (p= 0.004) higher prevalence of infection among elderly individuals (13.3%) than among individuals under 60 years of age (Table 3).

Table 3 - Prevalence of HBV, HCV and HTLV coinfection in the HIV-1-infected groups in the State of Piauí, Brazil in 2007.

Infection markers	**<60 years n = 775 n (%)**	**> 60 years n = 30 n (%)**	***p***
Anti-HBc total			
Positive	225 (29.1)	10 (33.3)	0.378
Negative	549 (70.8)	20 (66.7)	
NI	1 (0.1)	0 (0.0)	
Anti-HCV			
Positive	25 (3.2)	1 (3.3)	0.736
Negative	749 (96.7)	29 (96.7)	
NI	1 (0.1)	0 (0.0)	
Anti-HTLV			
Positive	14 (1.8)	4 (13.3)	0.004
Negative	760 (98.1)	26 (86.7)	
NI	1 (0.1)	0 (0.0)	

NI = No Information.
Source: Authors.

The evaluation of CD4+ T lymphocytes and HIV-1 viral load showed that most of the elderly had CD4+ T lymphocyte levels below 500 cells/mm^3 (66.6%) and a viral load lower than 10,000 copies/mL (83.3%); however, no significant difference was observed in comparison to that in the non-elderly group (Table 4).

Table 4 - Frequency of HIV-1 infected individuals according to CD4+ T lymphocyte levels and viral loads in the groups studied in the State of Piauí, Brazil in 2007.

Parameters	**<60 years n = 775 n (%)**	**> 60 years n = 30 n (%)**	***p***
CD4+ T lymphocytes (cells/mm^3)			
<500	543 (70.1)	20 (66.6)	0.312
>500	232 (29.9)	10 (33.4)	
Viral load (copies/mL)			
<10,000	611 (78.8)	25 (83.3)	0.544
>10,000	164 (21.2)	5 (16.7)	

Source: Authors.

4. Discussion

Improved living conditions have increased the life expectancy of the elderly population in different regions of the world (World Health Organization, 2011). In Brazil, it is estimated that 8.77% of the population is elderly (Instituto Brasileiro de Geografia e Estatística, 2018). Despite advances in the medical field that have enabled better detection and treatment of several diseases related to old age, the detection of HIV infection in elderly patients has been neglected due to several factors, which leads to late diagnosis in this group of individuals. Late diagnosis can promote the development of serious diseases related to HIV infection (Pratt et al., 2010).

The present study found that 3.7% of elderly individuals were infected by HIV, which was higher than the national average of the frequency of infections between the period from 2007 to 2016 (2.4%). However, the number of infections among individuals aged 60 or older has increased each year; in 2007, the frequency was 2.3%, and in 2017, it was 2.8% (Brasil, 2017). These results suggest that the prevalence of infections in the elderly may be underestimated since several factors are related to the late detection of infection among these individuals. In that direction, Alencar & Ciosak (2016) showed that these factors are mainly associated with the thinking of health professionals, who only request HIV tests for the elderly during prevention campaigns, or for widowers, who are a risk group, because they believe that older people no longer have sex or because age differences and gender issues make it difficult to discuss sexuality with the elderly (Alencar & Ciosak 2016). Furthermore,

health professionals associate diseases related to infection with other diseases characteristic of old age, which makes diagnosis of these individuals even more difficult (Godoy et al., 2008).

The late diagnosis of HIV infection in the elderly can also increase the chances of developing serious diseases and the risk of mortality since these patients present a slow recovery of $CD4^+$ T lymphocytes (Grabar et al., 2006; Greig et al., 2012). The group of HIV-infected individuals aged 60 years or older showed a 14.3% increase in the number of AIDS cases in the last 10 years (Brasil, 2017). In 2007, the incidence of AIDS among the elderly in the state of Piauí was 3.8 (per 100,000 inhabitants), increasing to 7.1 in 2012 (Brasil, 2013). Although the state of Piauí has an AIDS detection rate below the national average (2.4/100,000 inhabitants) (Brasil, 2017), it is relevant to diagnose the infection early, particularly in the elderly, because they present a natural decrease in immune system activity.

Most of the elderly in the study were male, corroborating data that show the highest prevalence of infection occurs among men in all age groups, including individuals 60 years of age or older (Menezes et al., 2007; Araújo et al., 2007). Notwithstanding, the frequency of infection has shown an increasing tendency among women. In 2007, women were responsible for 2.5% of cases, and by 2016, the frequency popped-up to 4.5% (Brasil, 2017). According to Silva et al. (2010), women are directly vulnerable to HIV due to their political, economic and socio-cultural context. In these circumstances, elderly women stand out due to the characteristics of their affective sexual relationships, which involve trust (Silva et al., 2010). Additionally, because women attribute the risk of contracting HIV infection to only the young, excluding themselves from the vulnerable group, this can make the diagnosis of HIV infection difficult in this age group.

Most of the evaluated elderly individuals were white with a low educational level, lived in the urban area, had a partner and had an income ranging from 1 to 4 times the minimum wage. In addition to the existence of racial and ethnic disparities in relation to HIV/AIDS morbidity and mortality, such disparities also persist in HIV testing, possibly due to low education and income levels, which limits access to and use of health services. For example, Afro-Brazilians are less likely to be tested for HIV infection (Holmes et al., 2008). The educational level of HIV/AIDS patients is lower than that of the general population, which reflects a lower level of information(Tomazelli et al., 2003). Several studies note that the individual's position in society is an important marker of their health conditions, where risk patterns are constantly unfavorable for individuals belonging to social groups that are less educationally privileged (Tomazelli et al., 2003; Silva et al., 2011; Fonseca et al., 2000).

Most of the elderly lived in the urban area, corroborating epidemiological records showing that the infection continues to be primarily urban (Brasil, 2017); additionally, the family income was equal to approximately the minimum wage, likely because this age group is usually composed of retired persons and social security benefit recipients, which allows these individuals to access and reside in the city.

The marital status evaluation showed a unique result: most of the elderly had a partner (stable relationship), unlike other studies that observed a majority of separated/divorced individuals (Menezes et al., 2007) or individuals without a partner (Bertoni et al., 2010). The stable relationship culture presupposes that men and women are protected against the risk of acquiring sexually transmitted infections by being monogamous (Maia et al., 2008). However, it has been suggested that people who consider themselves monogamous are less likely to develop safer sexual behaviors, which may facilitate the acquisition of infections in a possible extramarital relationship (Conley et al., 2015).

The analysis of the behavioral variables related to exposure to the HIV virus showed that HIV infection was more frequent among heterosexual elderly people, with this category of exposure being more frequent among individuals older than 13 years, although there has been an increase in the number of cases among homosexuals, with an increase of 32.9% in the last 10 years (Brasil, 2017).

The evaluation of condom use during sexual intercourse showed that all the elderly evaluated reported having sometimes used or never used condoms during sexual intercourse before contracting HIV. By contrast, Serra et al. (2013) reported the consistent use of condoms during sexual intercourse by most of the elderly interviewed. However, most of the elderly evaluated in the present study reported having at least one type of STD, which shows that the lack of condom use was significantly responsible for the vulnerability to the transmission of infectious and parasitic diseases, including HIV.

Among the elderly evaluated, 36.6% reported having sexual contact with sex workers. According to Santos et al. (2015), males older than 60 years resort more frequently to services from sex workers. Because all the elderly reported not consistently using condoms, the chances of acquiring the infection increase since sex workers represent a group at risk for HIV (Dandona et al., 2005).

Undergoing some type of surgery was reported by most of the elderly, and almost half reported having received a blood transfusion. Although surgery is an invasive procedure, which presents low chances of HIV transmission (CDC, 1988), some types of surgery have been associated with higher odds of viral transmission (Rewri et al., 2018). At the beginning

of the AIDS epidemic, blood transfusion was responsible for HIV transmission, mainly because the first serological tests used for blood bank screening were not as sensitive and could not identify individuals during the immunological window (Sandler et al., 1990). Currently, in Brazil, blood banks screen the samples through serological tests and NAT (nucleic acid test), which increase diagnostic sensitivity and prevent HIV transmission (Rocha et al., 2018).

The evaluation of co-infections showed that the elderly group presented a higher frequency of individuals co-infected with HTLV-1/2 (13.3%). This result may be mainly related to a lack of knowledge of HTLV infection among health professionals, which, together with the fact that most infections are asymptomatic, causes the frequency of infection to be underestimated (Zihlmann et al., 2012).

Although HIV-HTLV-1/2 co-infection induces an increase in the number of CD4+ T lymphocytes, this phenomenon should not be taken into consideration for the evaluation of the patient's immune status since these individuals present higher levels of activation and inflammation markers, which can lead to a more rapid progression to AIDS (Gudo et al., 2009). The majority of the coinfected elderly had CD4+ T lymphocyte levels lower than 500 cells/mm, which seems to be a consequence of the more advanced stage of HIV infection at the time of diagnosis and of age.

Although no significant difference was observed between the frequency of HIV-infected elderly individuals with different $CD4^+$ T lymphocyte levels and viral loads, the majority of these individuals had lower $CD4^+$ T cell levels. Even though the viral loads were lower, these results show that at the time of diagnosis, the infection in these individuals was no longer being controlled. Studies have shown that HIV-infected individuals with higher CD4+ T lymphocyte counts have a marked inflammatory profile, which leads to progression of the infection and the development of AIDS (Hunt et al., 2008; Li et al., 2015; Platten et al., 2016). Thus, the Ministry of Health, with the objective of reducing morbidity and mortality in persons living with HIV (PLHIV) and reducing transmission, recommends the immediate initiation of treatment for all PLHIV, regardless of their clinical and immunological status. However, the evaluation of the CD4+/CD8+ parameters and viral load remain indispensable for monitoring the response to antiretroviral therapy (Brasil, 2017b).

5. Final Considerations

The results showed that the frequency of HIV-1 infected elderly individuals in the state of Piauí was 3.7%, the majority of whom were male, had a low educational level, lived in the urban area, were married, and had a family income greater than the minimum wage. The main behavioral risk factors associated with these individuals included lack of condom use and history of STD, surgery or blood transfusion. These individuals also had a higher frequency of HTLV-1/2 co-infection. Identifying the main characteristics related to HIV infection in the elderly is important to show that these individuals are also susceptible to HIV-1 infection and that these individuals must be made aware of risk behaviors. In addition, the presence of infection-related symptoms in this group must be investigated and diagnosed as soon as possible to prevent the development of serious diseases resulting from HIV infection.

This study finds limitations when it is based only on the elderly population of the State of Piauí and as perspectives for future work, we envision a georeferenced study by municipality in the state and thus to locate this elderly population HIV-AIDS.

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